

2009

River Derg and Tributaries Catchment Status Report



Loughs Agency of the Foyle
Carlingford and Irish Lights
Commission

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River Derg and Tributaries Catchment Status Report 2009



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Picture of hen
salmon in
breeding dress
courtesy of
Atlantic Salmon
Trust

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River Derg and Tributaries Catchment Status Report 2009

1.0 INTRODUCTION

Welcome to the 2009 Loughs Agency Catchment Status Report series. The reports have been updated in 2010 to include survey data collected during 2009. Environmental issues of relevance to the water quality and fisheries resources of the Foyle and Carlingford areas are discussed and intervention outlined.

This is one of an annual series of catchment status reports produced by the Loughs Agency. The primary objective of the catchment status reports is to disseminate catchment specific information to all interested stakeholders. The reports continue to be consulted widely by a variety of stakeholders including local angling associations, fishery owners, statutory bodies, environmental consultants, students, conservation Non Governmental Organisations and private individuals. The catchment status reports provide summary data which demonstrates the work that the Loughs Agency conducts within specific catchments and outlines catchment specific objectives.

The theme for the 2009 catchment status reports is water quality. The first River Basin Management Plans, a requirement under the European Union Water Framework Directive (2000/60/EC) were published in December 2009. These reports are written for each river basin district by the competent authorities in both Northern Ireland and the Republic of Ireland. Some of the river basin districts are classified as International River Basin Districts and within these areas there is cooperation in managing shared waters. The Water Framework Directive (WFD) requires the assessment of aquatic ecological status. Ecological status has been and will continue to be monitored using new monitoring programmes and classification systems developed for the Water Framework Directive. Initial results and more details on the parameters measured are provided within this report. The Loughs Agency has been conducting freshwater fish monitoring for inclusion within overall surface water classifications in both Northern Ireland and the Republic of Ireland and is well positioned to facilitate and participate in the implementation of programmes of measures designed to improve water quality on a cross border basis.

Water bodies will continue to be monitored within each six year reporting cycle for river basin planning with reporting due next in 2015, 2021 and 2027. The overall objective is to have all water bodies reaching good ecological status. The River Basin Management Plans are intended to provide the primary means of coordinating and integrating the management and protection of the aquatic environment. Working in partnership has been highlighted within the directive as an essential mechanism

for full implementation and delivery. The Loughs Agency is playing an active role within this process and would encourage all stakeholders to participate fully.

Programmes of measures to deliver the key objective of attaining good ecological status within all water bodies have been developed and will need to be further refined with active participation from statutory and non statutory bodies. Local Management Areas (LMA's) have been defined by the Northern Ireland Environment Agency (NIEA) with information leaflets produced which include details of specific local measures identified to improve the aquatic environment within these areas. Continued consultation and partnership working will be required to maximise the potential of these and to develop them into feasible action plans. The Loughs Agency views the contribution of the catchment status reports as vital to informing planned action for improving the local aquatic environments of the Foyle and Carlingford areas.

Loughs Agency members of staff also play an active part in Water Framework Directive implementation through active participation within the Catchment Stakeholder Groups, Northern Ireland Water Framework Directive Fish Group and other Water Framework Directive working groups.

1.1 The Derg Catchment

The River Derg and tributaries have a channel length of approximately 60km and a catchment area of 438km². The rivers generally flow in an easterly direction from the Killeter uplands through the town of Castlederg to its confluence with the River Mourne.

The main River Derg drains Lough Derg and the surrounding catchment. The primary tributaries of the Derg catchment include the Mournebeg River, Leaghany River and Glendergan River. The Derg valley is broad in nature and is enclosed by an undulating landscape of rounded hills. The Derg catchment has many shallow tributary valleys with gently undulating landform. In places low embankments enclose the main River Derg to protect agriculturally productive land from flooding, this is predominantly restricted to the lower end of the catchment where the land is more suited to intensive agricultural use.

Extensive patches of peaty marsh, scrubby fen woodland and open moorland dominate the upland areas of the catchment. Stone walls and hedgerows enclose field boundaries and drainage ditches. There is little forestry in the lower Derg valley which is in stark contrast to the upper Derg valley and Killeter uplands where extensive commercial coniferous forestry plantations are maintained.

The coniferous forestry plantations within the Derg catchment create hard angular lines across the landscape and overshadow many of the burns and tributaries of the upper Derg catchment. There are large areas of cut over blanket bog and large expanses of intact bog of national and international importance within the catchment. The Derg catchment has a number of important mesotrophic lakes (middle level of nutrients) and oligotrophic lakes (low level of nutrients).

The Derg catchment is a cross border river catchment with the headwaters and Lough Derg in the Republic of Ireland and the main river and tributaries predominantly in Northern Ireland.



Fig 1.1 Upper section of the River Derg. Note large scale coniferous forestry plantations

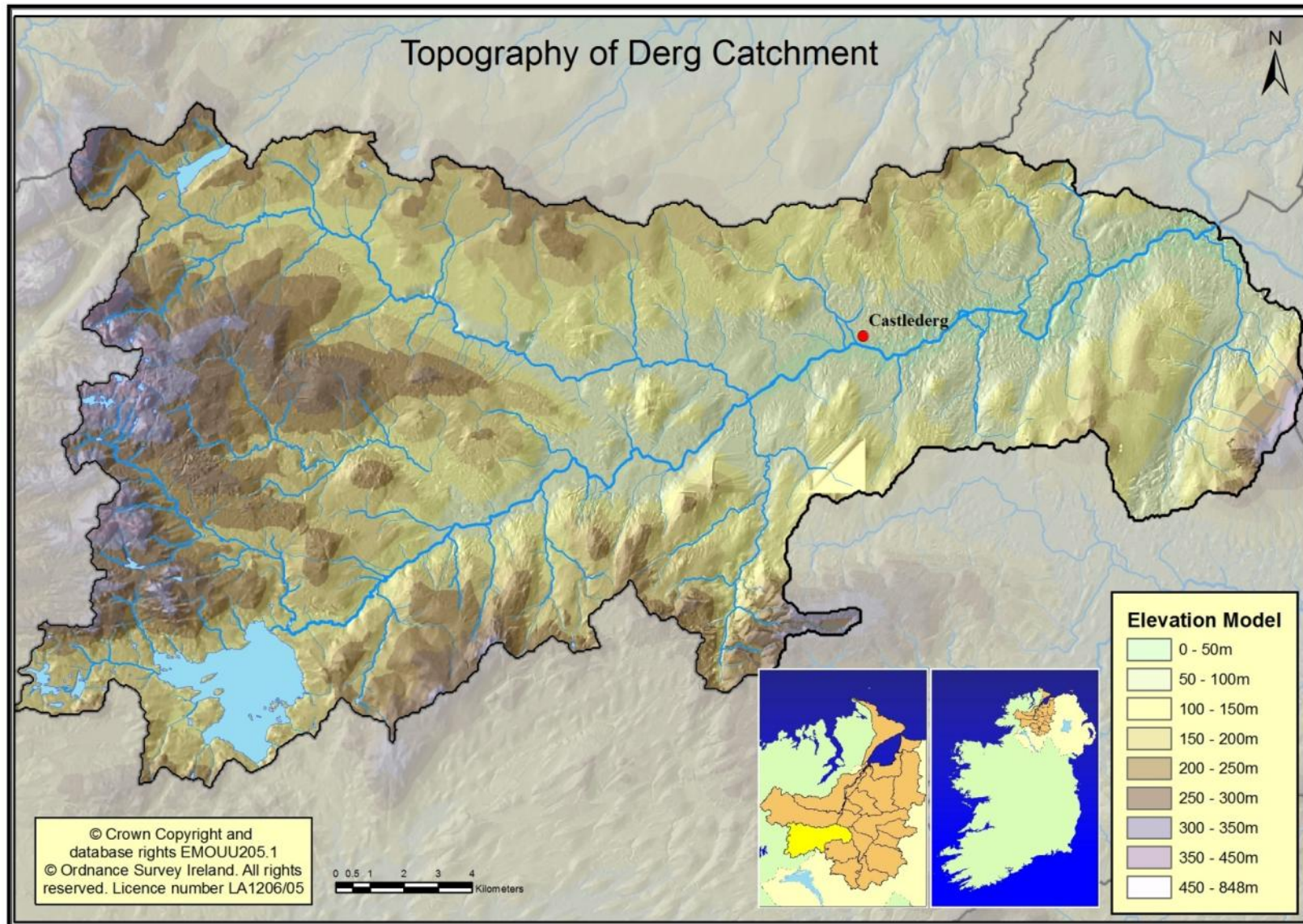


Fig 1.11. Derg catchment topographical map with river network.

1.2 Atlantic Salmon and Sea Trout

Salmon and Sea Trout are referred to as being anadromous meaning that they migrate between the freshwater and marine environments returning to freshwater to reproduce. This complex life history exposes them to varied environmental pressures and recreational and commercial fisheries.

Adult Atlantic salmon return to their natal rivers where spawning takes place. Sea trout also demonstrate an ability to return to their natal river but their homing instinct may not be as strong as those of the Atlantic salmon. After the eggs hatch the juveniles (initially referred to as fry and then parr) remain in freshwater for up to three years.

Smoltification is the physiological adaptation which occurs when the juvenile salmon change from the parr stage (freshwater phase) to the smolt stage (marine phase). In the Foyle system this can occur after one, two or three years. Most Foyle salmon (referred to as post smolts) will remain after smoltification in the North Atlantic for one year and are referred to on their return to the coast and rivers as grilse. Salmon which stay at sea for longer than one year are referred to as multi sea winter (MSW) salmon.

1.3 Non Salmonid Fish Species

As highlighted earlier populations of other non salmonid fish species occur within the Derg catchment. In the past monitoring was targeted at salmonid species however with obligations under the Water Framework Directive other non salmonid fish species are being monitored more closely.

Fish species presence and abundance can act as a good environmental/ecological indicator demonstrating the ability of the aquatic habitat to support a diverse array of native species. Populations of the European Eel, Three spined stickleback, River/Brook and possibly Sea Lamprey form an important part of the native fisheries biodiversity of the Derg catchment. Maintaining high standards of water quality and appropriate habitat for these species is essential for the overall health of the aquatic ecosystem.



Fig 1.3 Sample of fish from the Foyle estuary

2.0 ATLANTIC SALMON STOCKS

In order to describe the status of salmon stocks each of the following points need to be considered:

- Redd Counts
- Juvenile abundance
- Marine survival
- Adult abundance
- Exploitation

2.1 Redd Counts

Redds are spawning nests created by salmon or trout. Differentiation between salmon and trout redds can be made as salmon redds tend to be larger in size and trout tend to spawn earlier than salmon within the Foyle system. Research within the Foyle system using extensive annual redd count data has highlighted a good relationship between the number of redds and the total annual catch of salmon. Table 2.1 shows redd count data for the Derg catchment and the Foyle system. Water flow is of significance when monitoring redds as in high water conditions the ability to see and count redds in rivers is impaired. Figure 2.12 outlines redd counts within the Foyle area and the Derg catchment.

	2005/06	2006/07	2007/08	2008/09	2009/10
Foyle System	5354	*1338	3039	5507	
Derg Catchment	498	*N/A	567	618	
Derg as a % of Foyle	9	*N/A	19	11	

Table 2.1 Redd counts for Foyle system and Derg catchment 2004/05 – 2009/10. *Note 2006/07 had extremely poor water conditions for redd counting

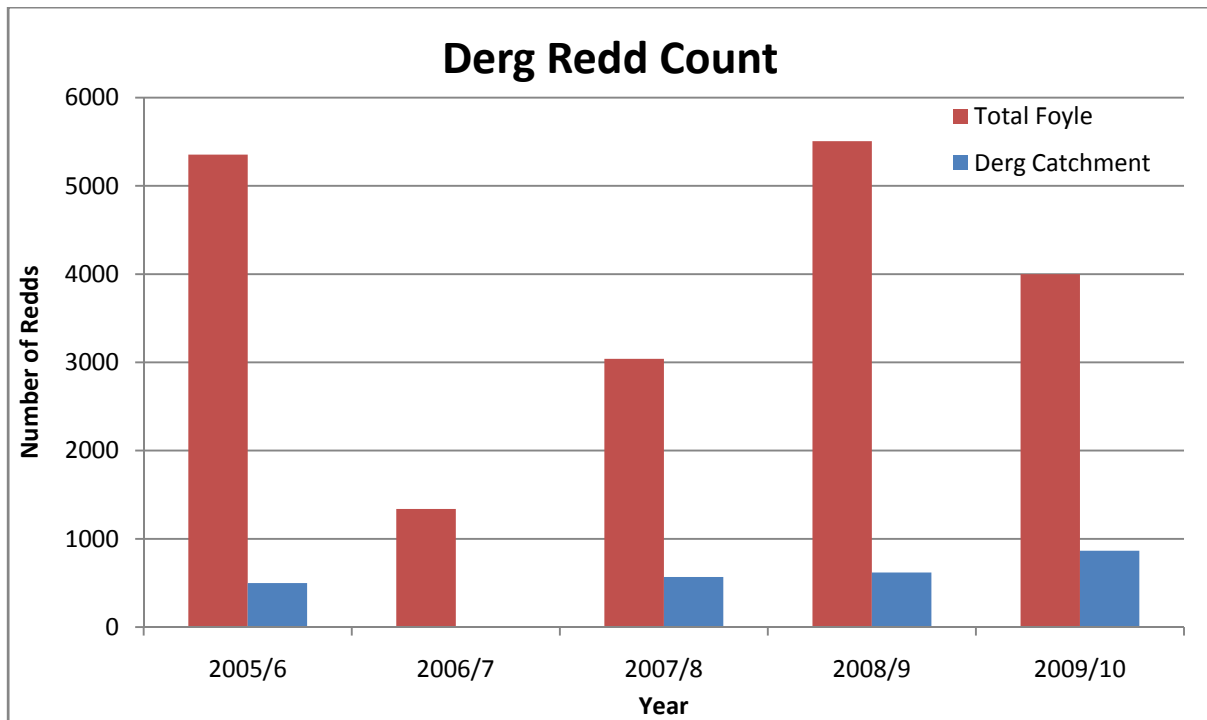


Fig 2.1 Redd counts for Foyle system and Derg catchment 2004/05 – 2009/10. *Note 2006/07 had extremely poor water conditions for redd counting

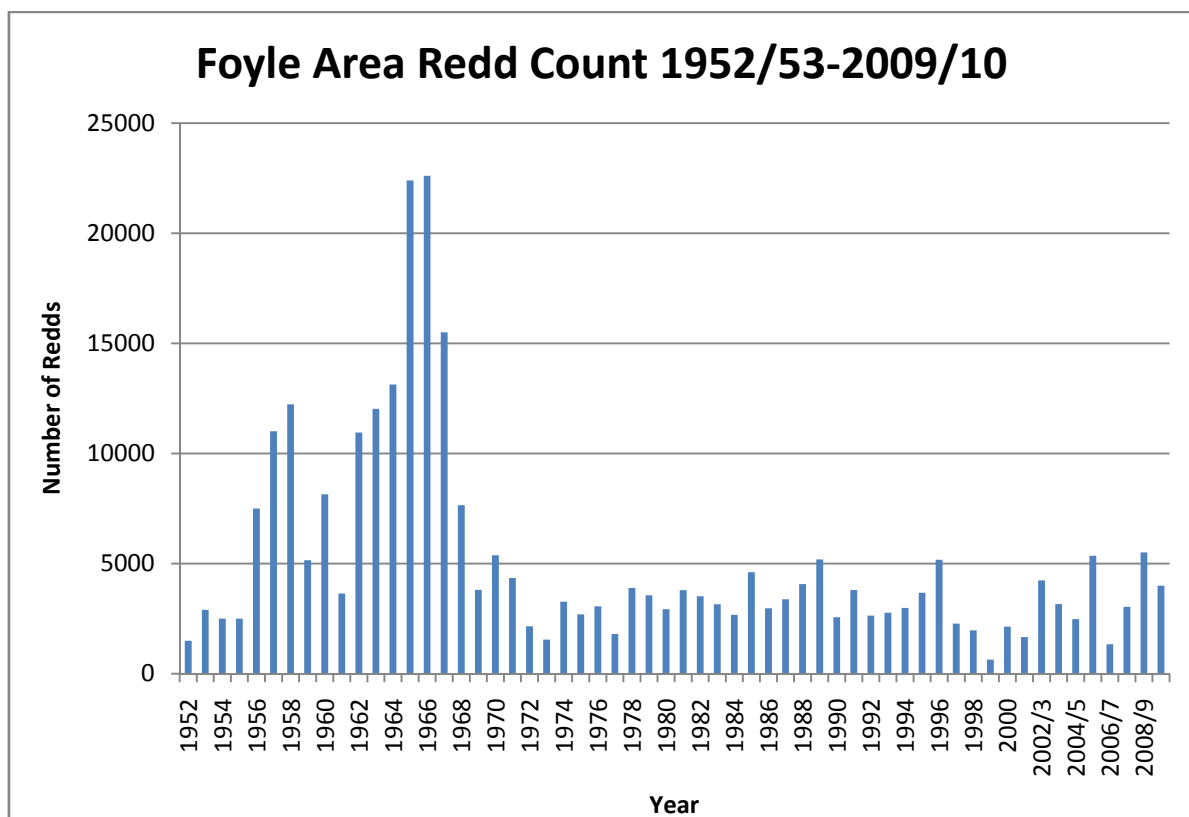


Fig 2.11 Redd counts for Foyle system 1952/53 – 2009/10

2.2 Juvenile Abundance

Within the Loughs Agency jurisdiction trends in abundance of juvenile salmonids are monitored by annual semi-quantitative electrofishing surveys. The numbers, age and species of fish captured during five minute timed electrofishing surveys are compared with previous year's data allowing for change to be monitored, facilitating suitable fishery management practices to be implemented.

In 2009 a total of 485 sites were semi-quantitatively electrofished within the Foyle system. The results for each site for salmon and trout are classified as excellent (>25 fish), good (15-24 fish), fair (5-15 fish), poor (1-4 fish) and absent (0 fish), Table 2.2. Figures 2.21 - 2.22 outline the salmon 0+ electrofishing results and site classifications for the Derg catchment in 2009. Please consult previous status reports for site classifications in other years.

Semi-quantitative electrofishing was developed to monitor 0+ salmonids (fry/young of the year). In order to quantify the abundance of 1+ salmonids (parr and older) fully quantitative electrofishing surveys are required which can be used to calculate fish densities within a defined area. Rivers and tributaries with good environmental quality are more likely to support good populations of each year class.

Fish populations can vary considerably over time and location, it is therefore necessary to monitor the populations over a period of years to highlight meaningful trends before considering remedial activities such as habitat improvement works. These trends are being continually monitored by the Loughs Agency and the most appropriate management options considered.

There are a variety of reasons why electrofishing sites may be perceived to be under producing, these can include, lack of suitable juvenile habitat, the presence of impassable obstacles to migratory fish species on lower sections of a tributary, pollution, inconsiderate channel maintenance, tunnelling by bank side vegetation, stream gradient and poor forestry practices etc. The critical point is to recognise the major factors at play and to investigate all possible reasons for underproduction accepting that there may be inherent reasons as to why production may not be improved upon in certain areas. When the same areas are surveyed for other non salmonid species it may be discovered that they provide habitat more suited to these species. Habitat improvement works and the rationale behind them are discussed in greater detail later.

Obligations under the Water Framework Directive are driving quantitative surveys of both salmonid and non salmonid species under proposed Surveillance, Operational, Investigative and Protected Area monitoring programmes.






Symbol	Grade	Number of 0+ Salmonids
	Excellent	>25
	Good	15-24
	Fair	5-14
	Poor	1-4
	Absent	0

Table 2.2 Loughs Agency semi-quantitative electrofishing classification system for 0+ salmon and trout

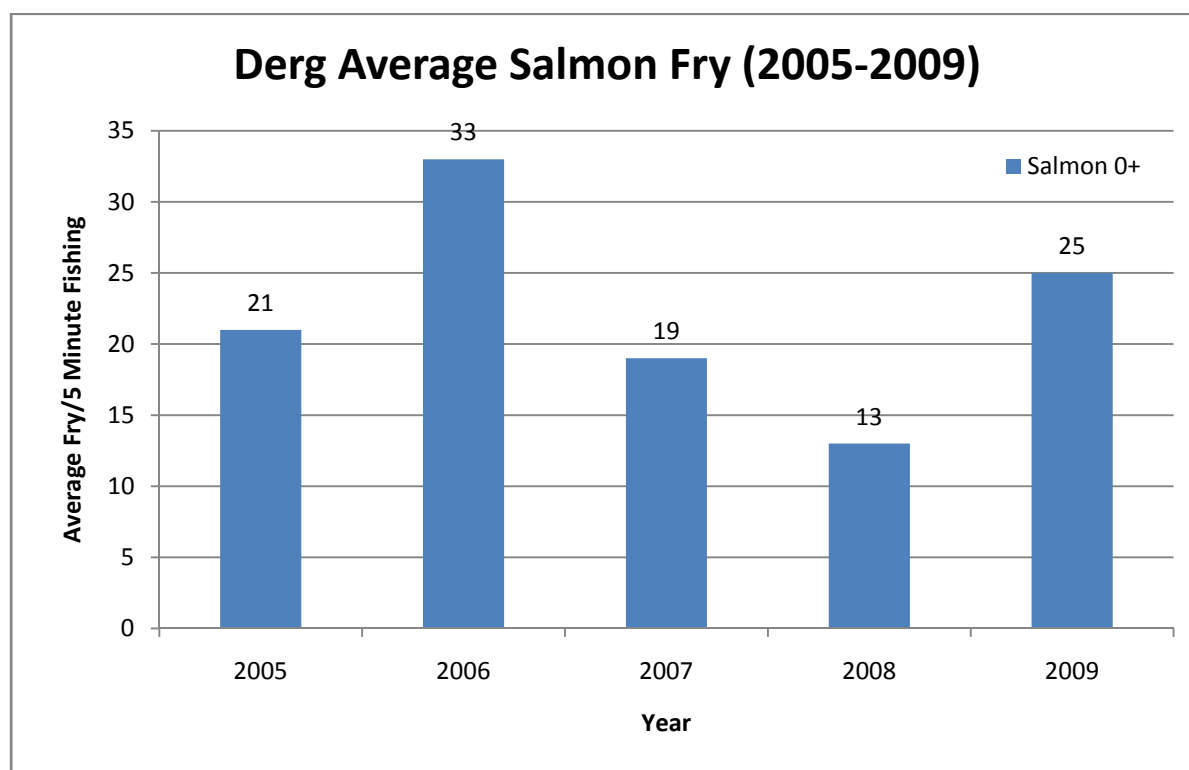


Fig 2.21 River Derg catchment salmon fry index 2005-2009, based on mean salmon fry numbers at 26 standard sites surveyed annually.

Summary of Salmon Fry Semi Quantitative Electrofishing Results 2009

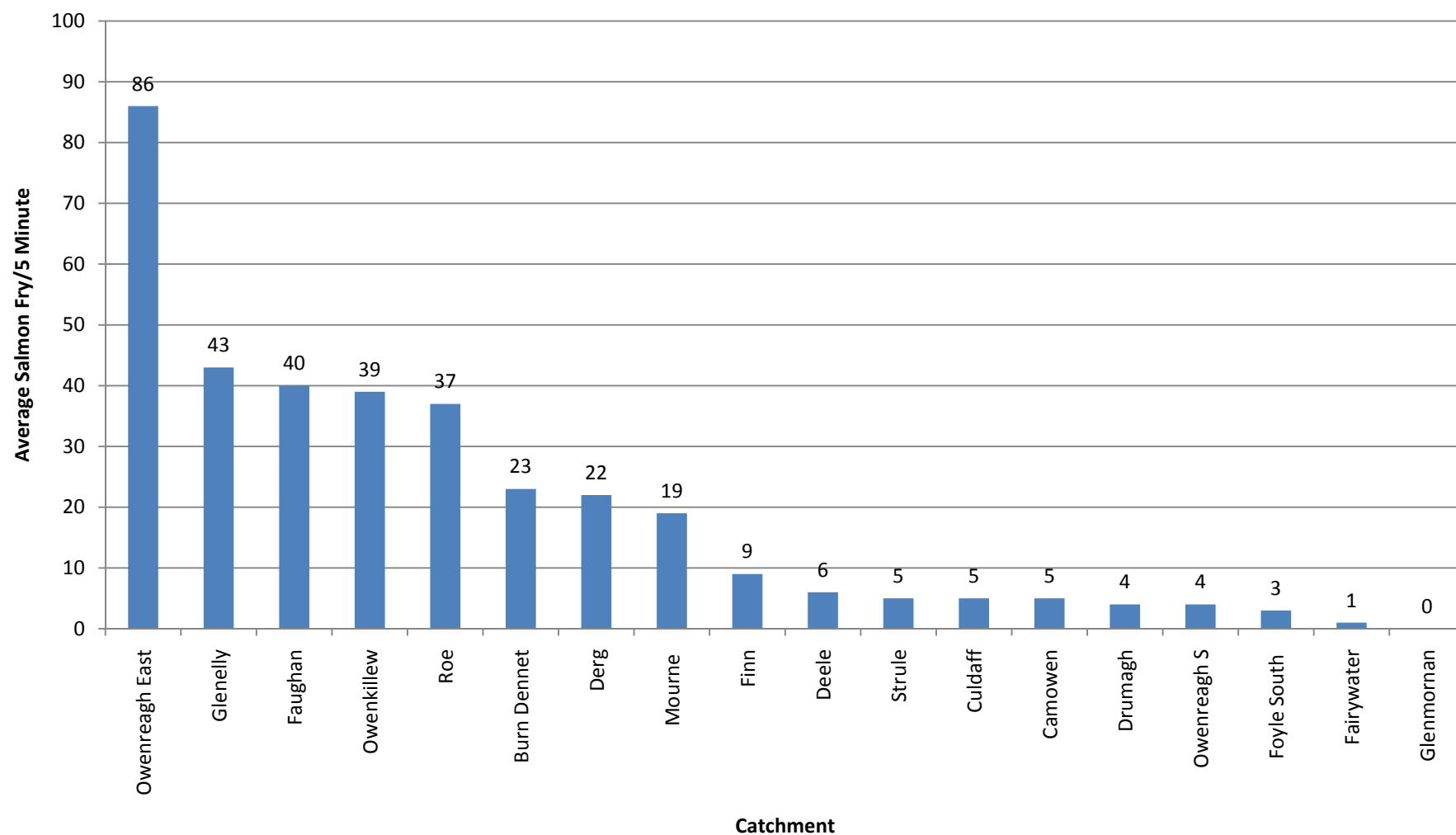


Fig 2.22. The mean abundance of salmon fry in 18 catchments in 2009 from semi quantitative electrofishing. *Note above graph is mean for 2009 at all sites surveyed.

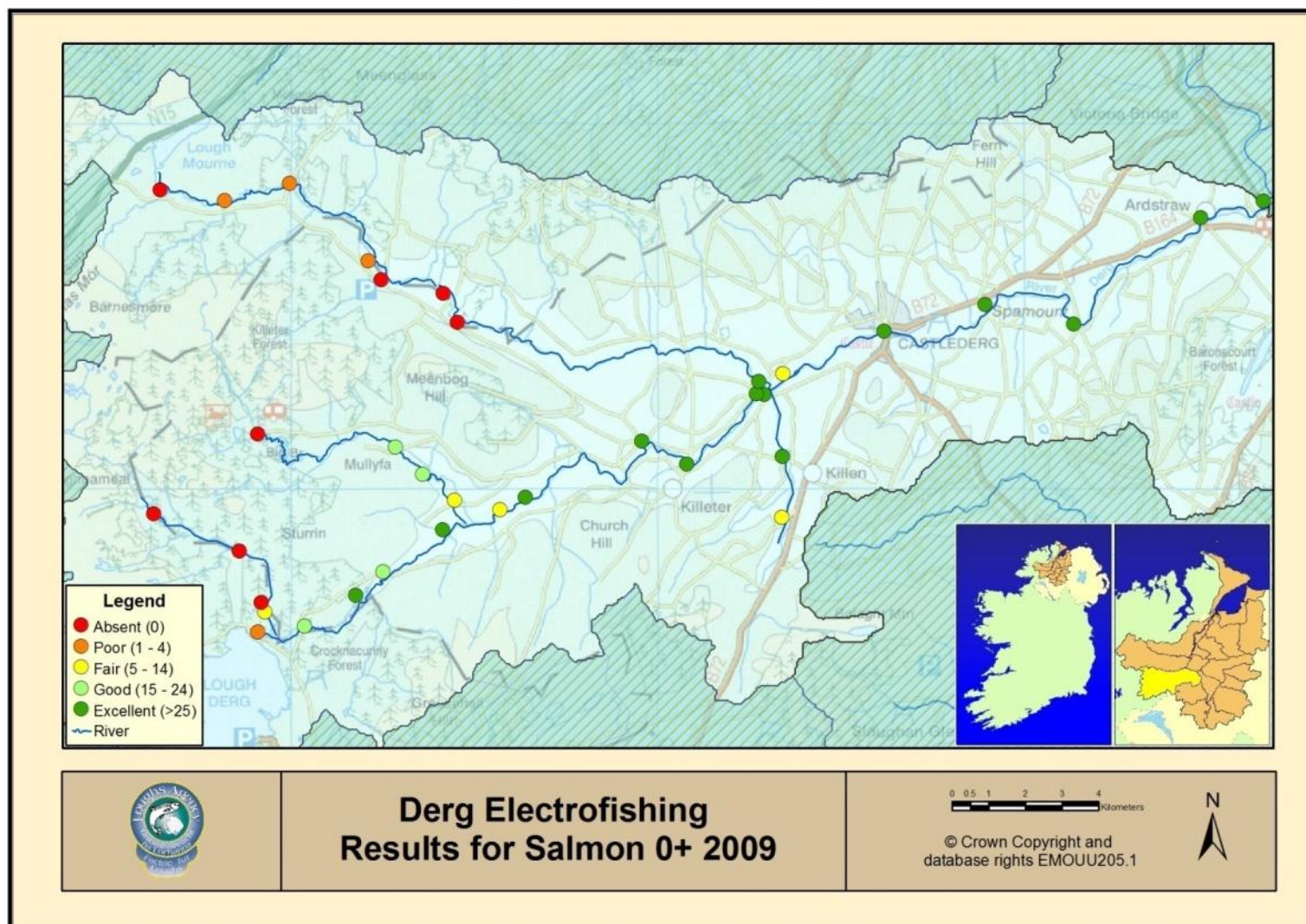


Fig 2.22 Salmon 0+ electrofishing site classification 2009

3.0 TROUT STOCKS

Annual trends in the populations of juvenile trout are also monitored within the Loughs Agency jurisdiction using the same methodology and classification system as those employed for salmon. The semi quantitative electrofishing results for trout fry in the Derg catchment and site classifications are displayed in Figs 3.1, 3.11 & 3.12.



Fig 3 Electrofishing survey and trout parr

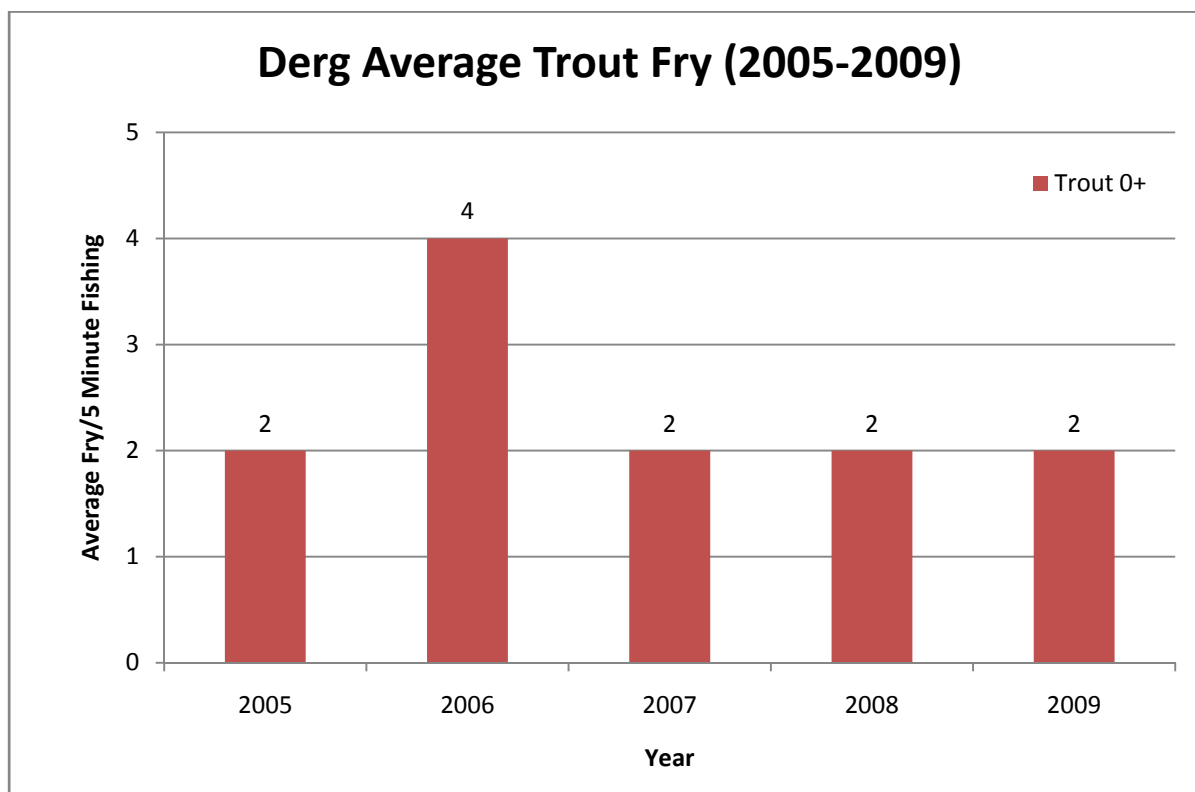


Fig 3.1 River Derg catchment trout fry index 2005-2010, based on mean salmon fry numbers at 26 standard sites surveyed annually.

Summary of Trout Fry Semi Quantitative Electrofishing Results 2009

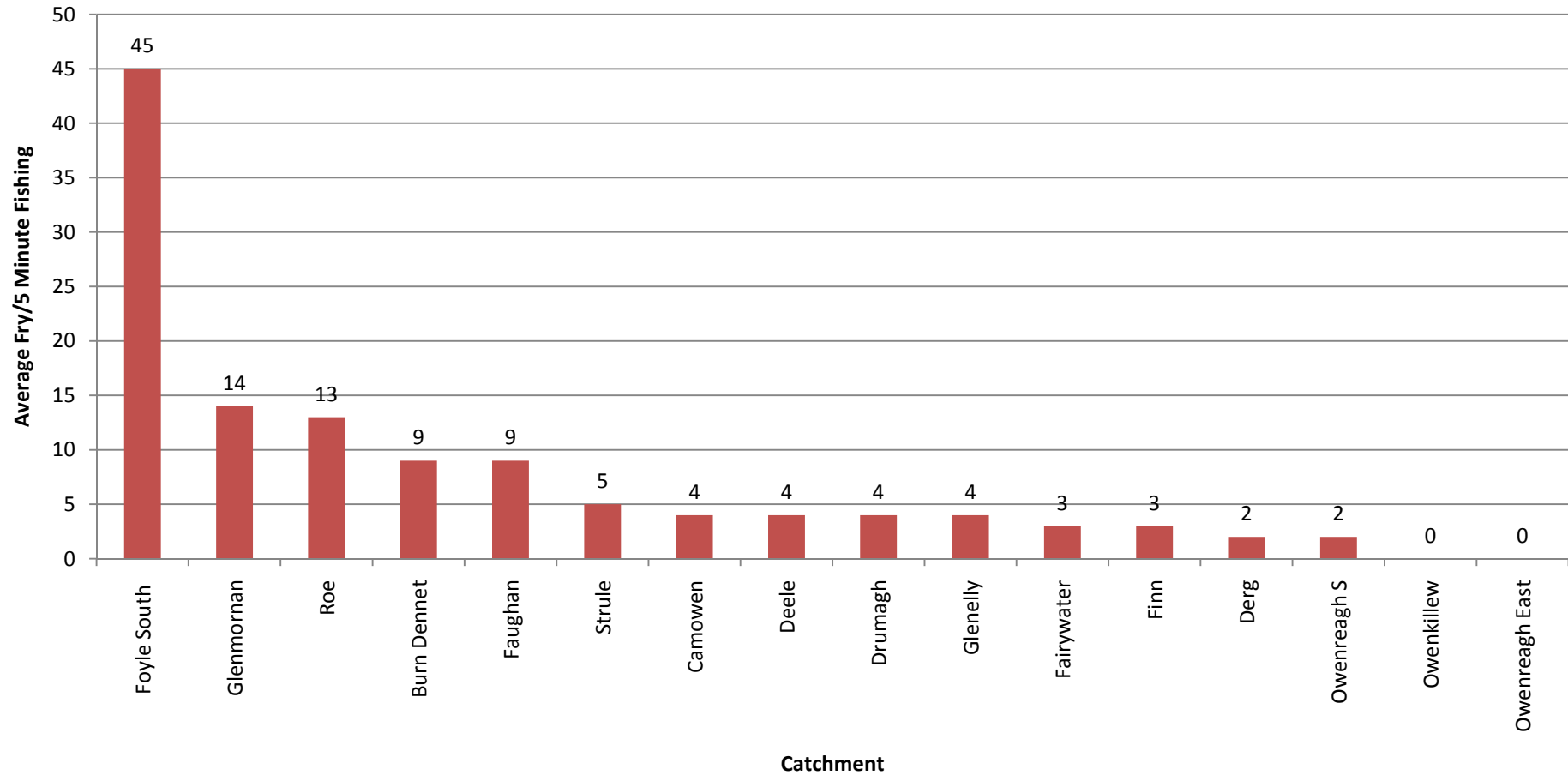


Fig 3.11. The mean abundance of trout fry in 18 catchments in 2009 from semi quantitative electrofishing.

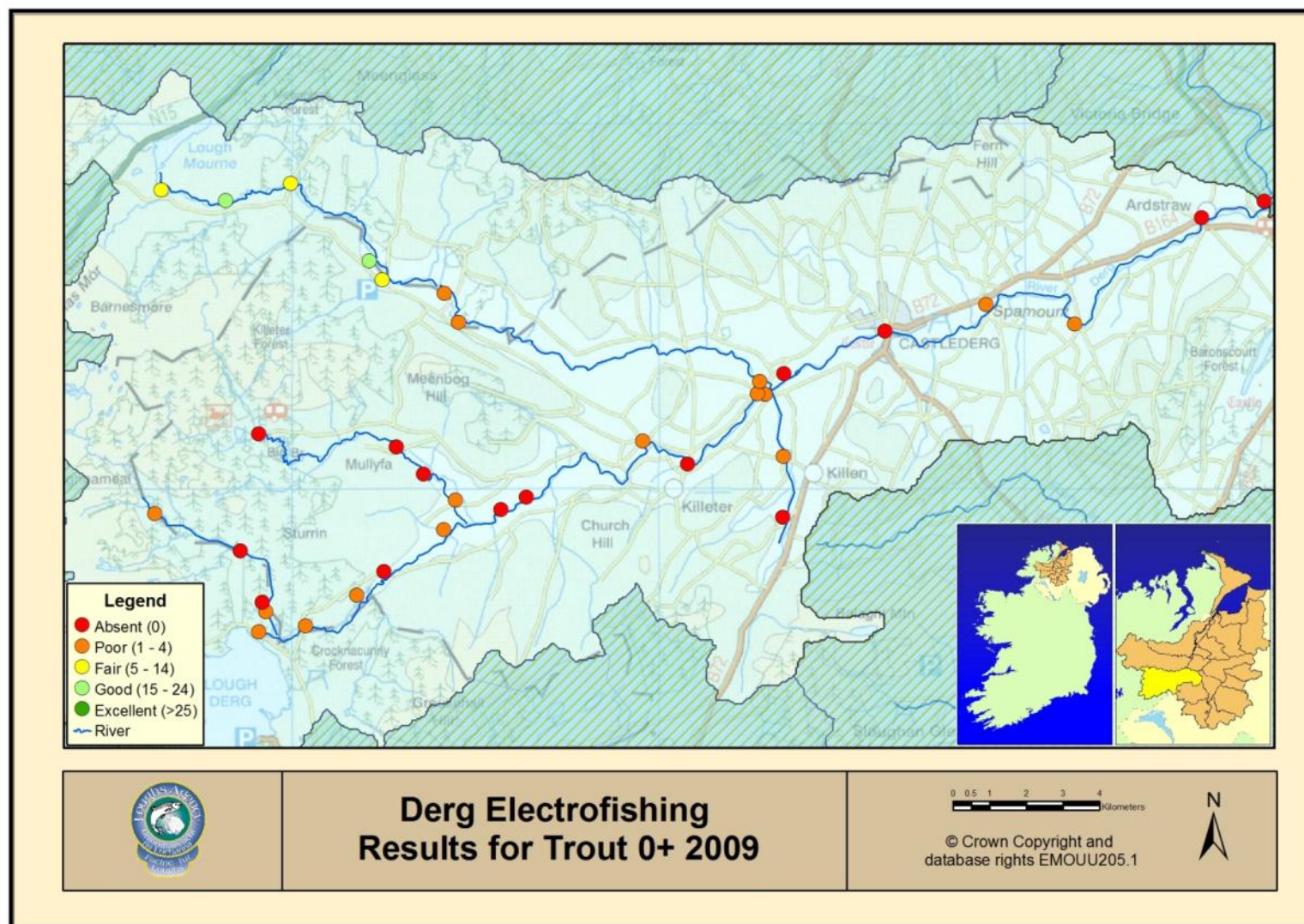


Fig 3.03 Trout 0+ electrofishing site classification 2009

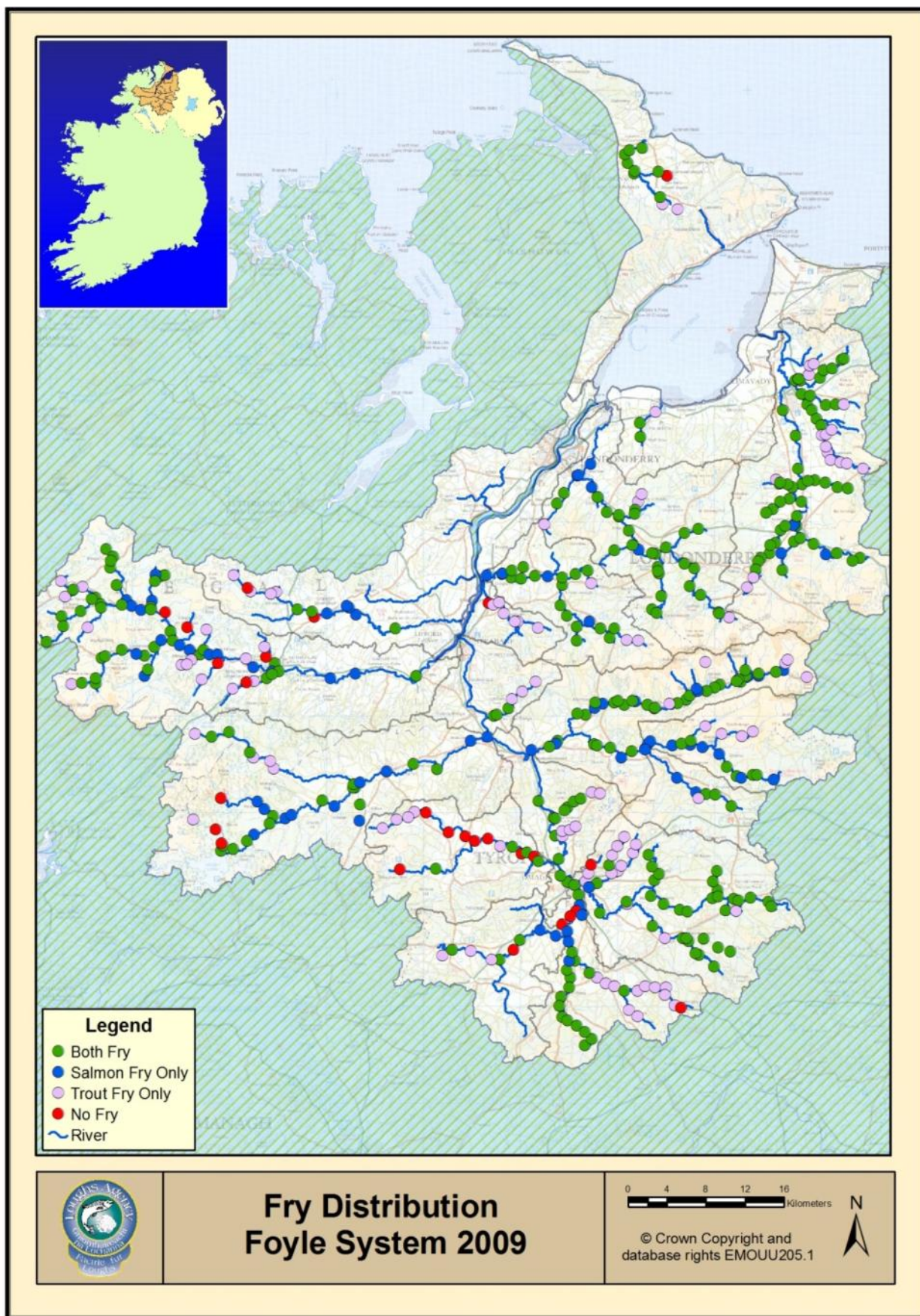


Fig 3.13 Salmon and Trout fry distribution 2009

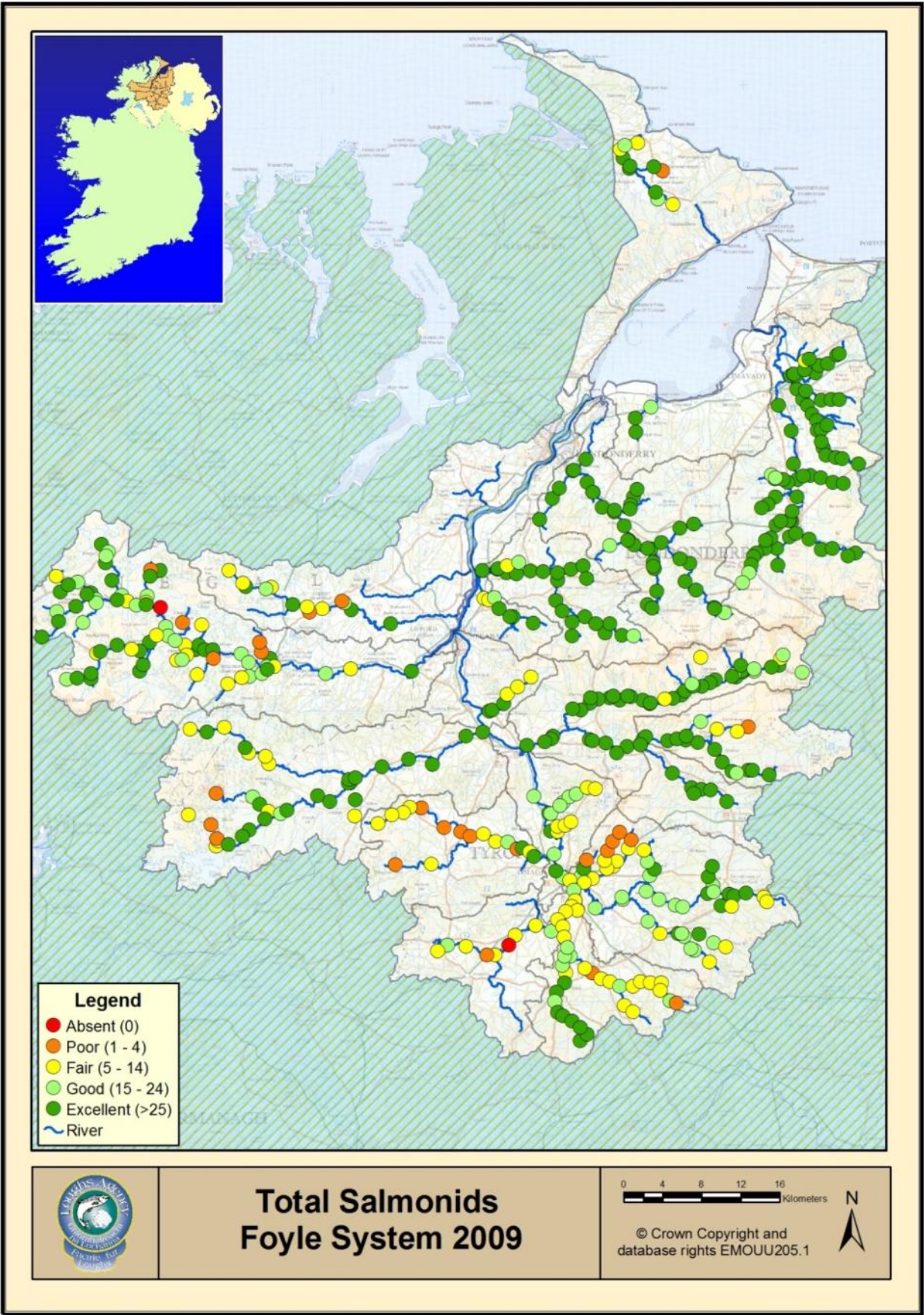


Fig 3.15 Total salmonid (salmon/trout fry and parr) distribution 2009

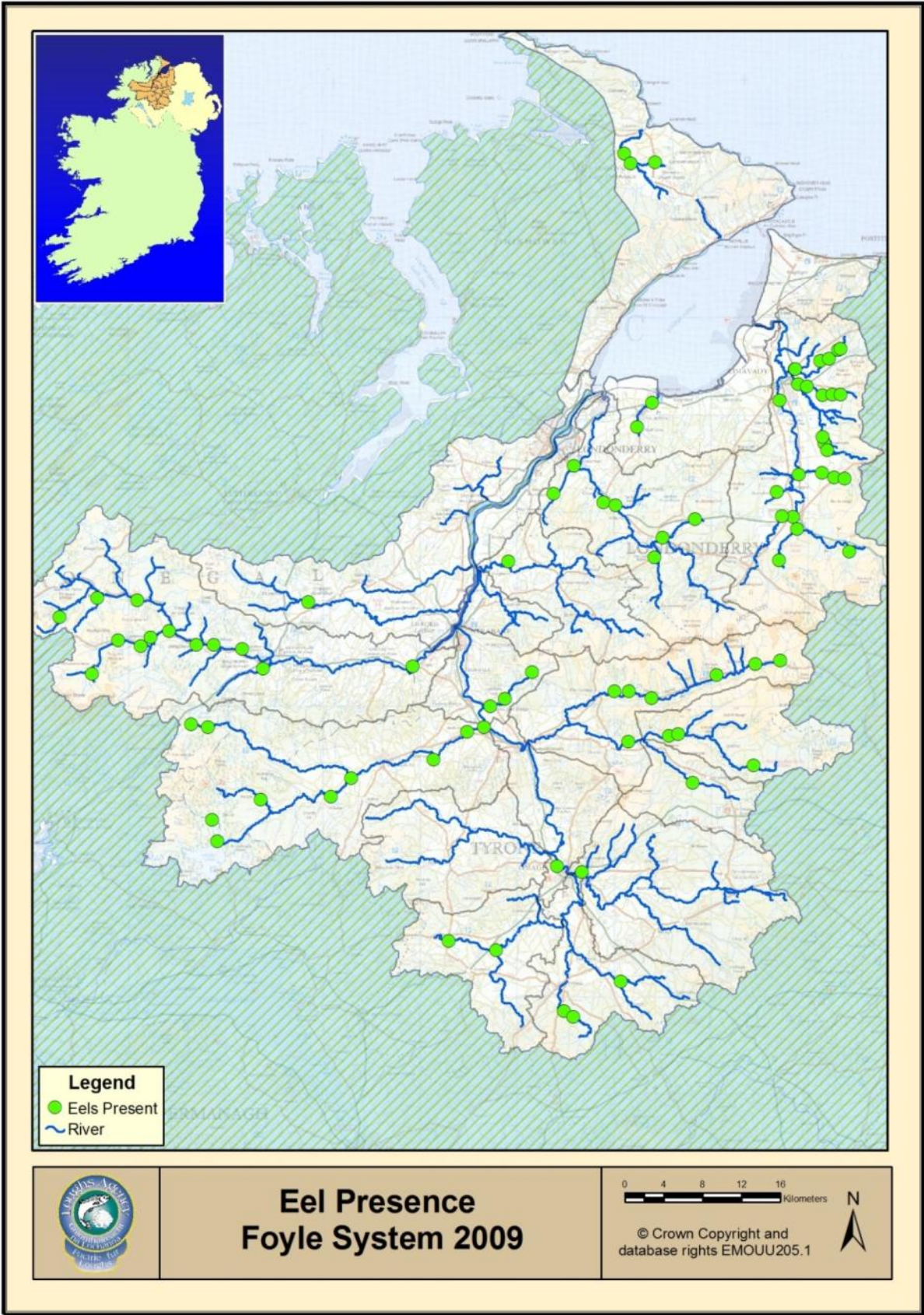


Fig 3.16 Eel presence as recorded during semi quantitative electrofishing surveys 2009. *Note technique used is designed specifically for salmonids.

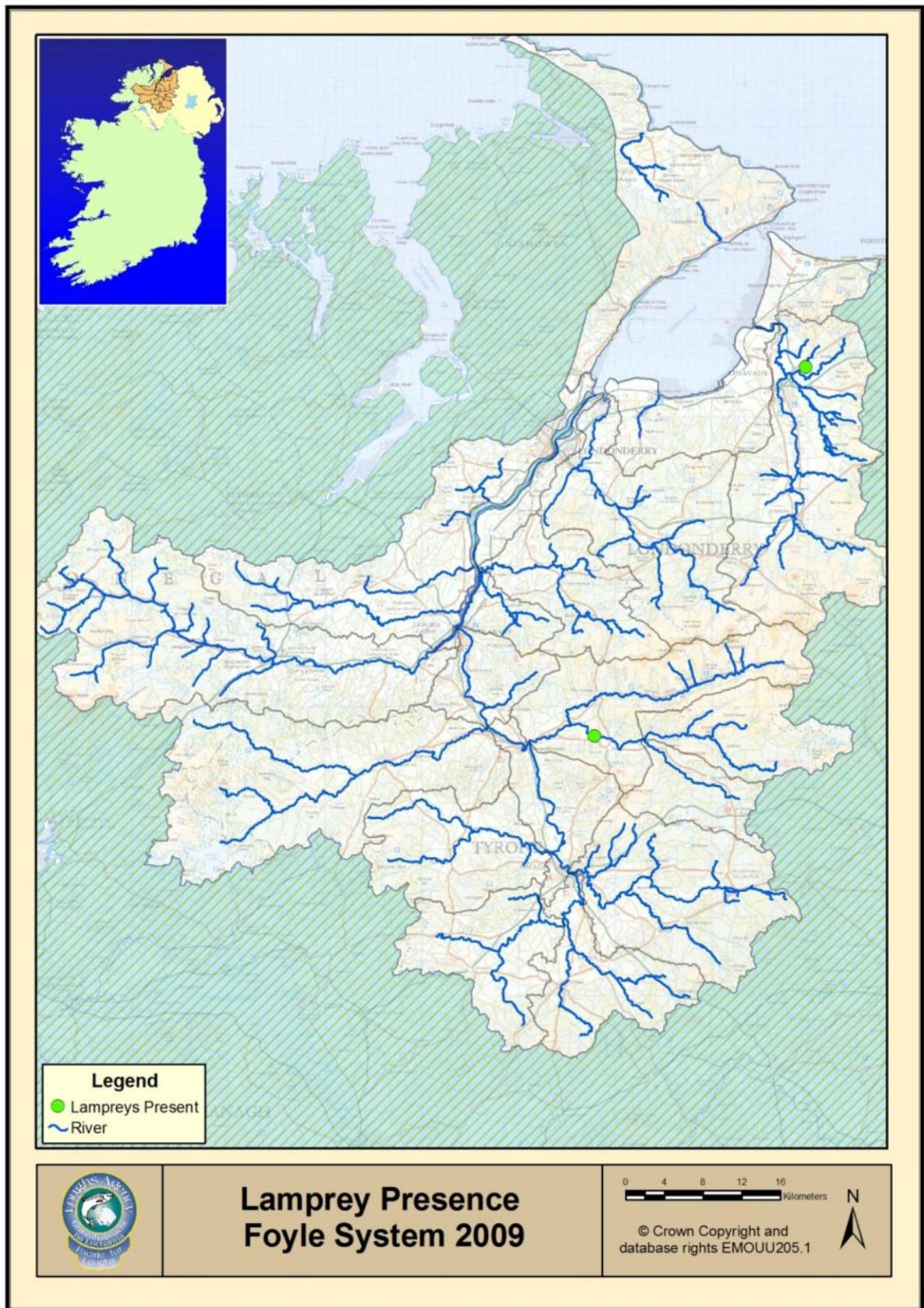


Fig 3.17 Lamprey presence as recorded during semi quantitative electrofishing surveys 2009. *Note technique used is designed specifically for salmonids. Further surveys will be required to accurately monitor lamprey populations.

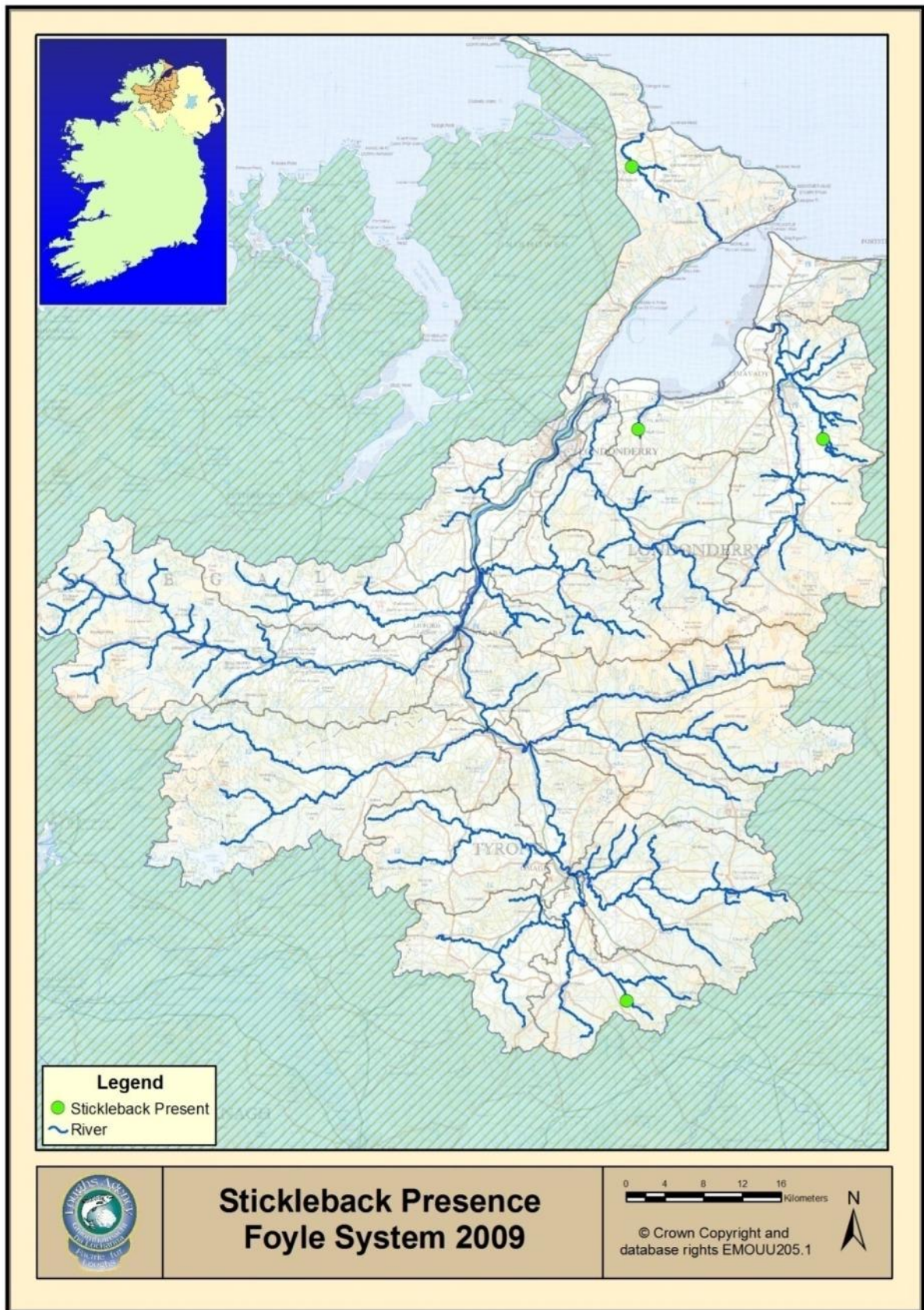


Fig 3.18 Stickleback presence as recorded during semi quantitative electrofishing surveys 2009. *Note technique used is designed specifically for salmonids.

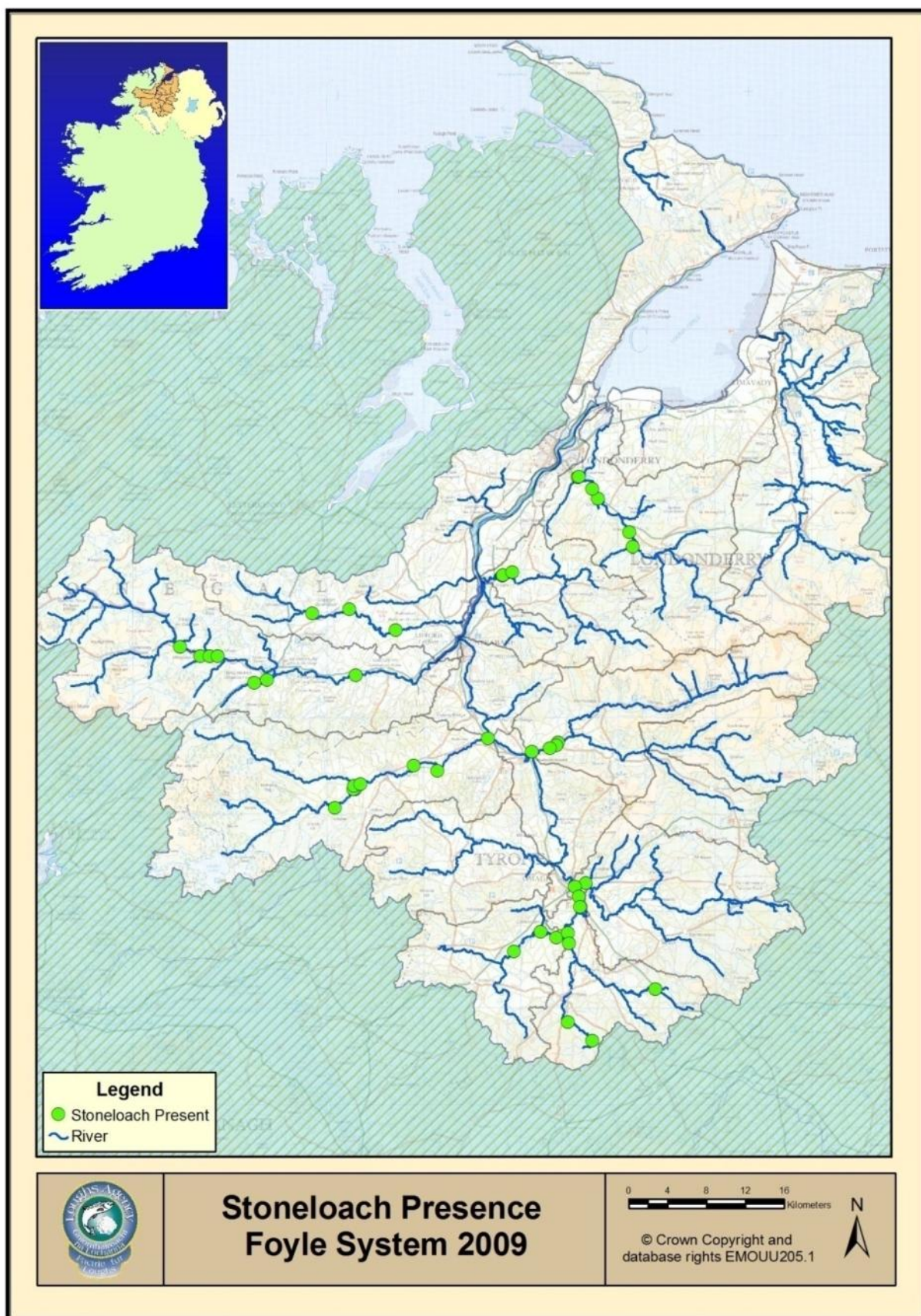


Fig 3.18 Stoneloach presence as recorded during semi quantitative electrofishing surveys 2009. *Note technique used is designed specifically for salmonids.

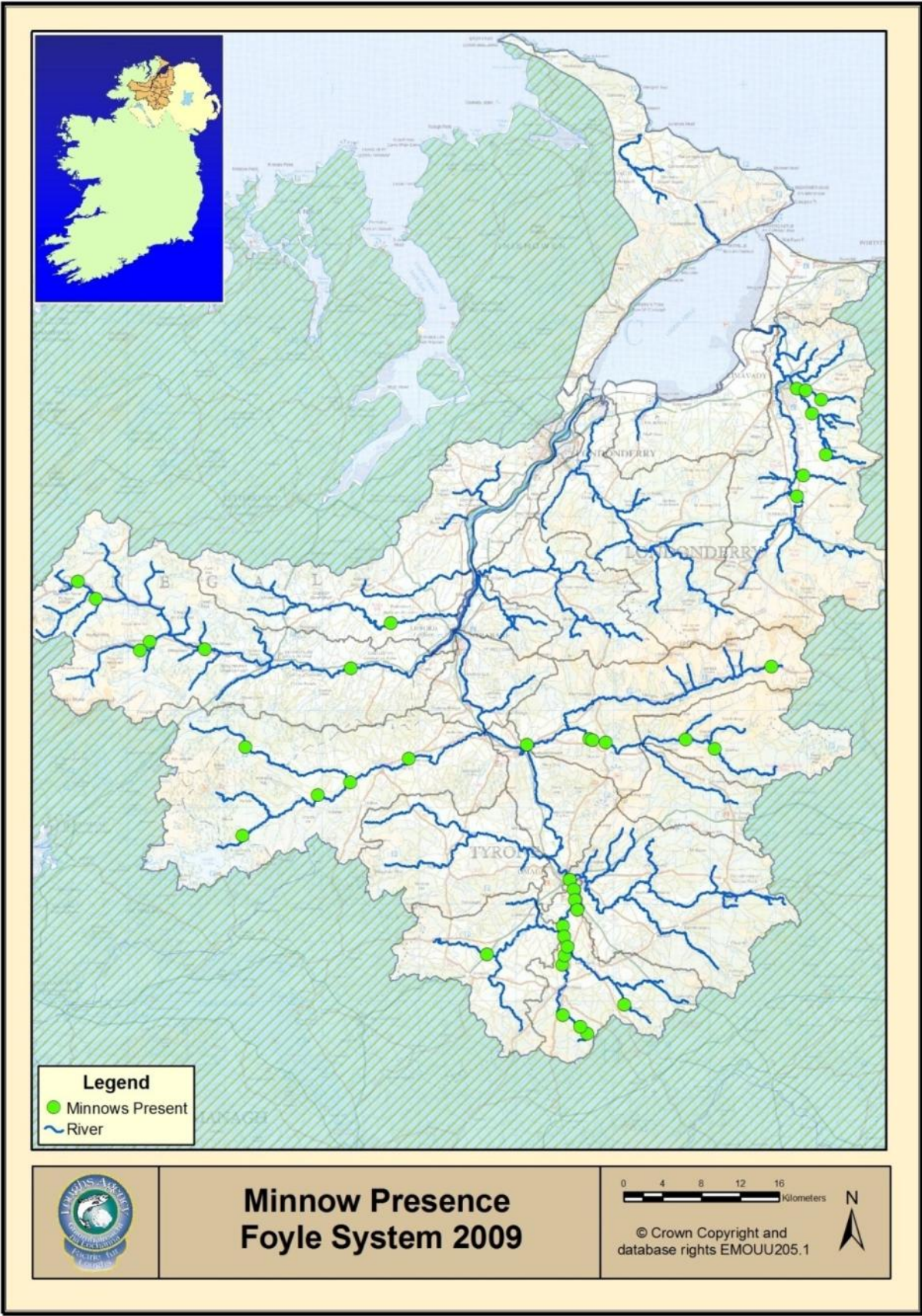


Fig 3.19 Minnow presence as recorded during semi quantitative electrofishing surveys 2009. *Note technique used is designed specifically for salmonids.

4.0 MARINE SURVIVAL

The numbers of salmon that survive to return to the freshwater environment are greatly influenced by conditions in the marine environment. Climate change leading to changes in sea surface temperatures, prey abundance, high seas fishing, marine pollution, sub lethal levels of pollution and predation all have an effect on the Atlantic salmon and indeed other migratory fish species chances of survival.

Marine survival trends are monitored on a number of index rivers in the North East Atlantic where total trapping facilities are available for both migrating juvenile and adult populations. Total trapping allows for an accurate count of all migrant smolts (total freshwater production) and returning adults to be made and therefore an accurate estimate of marine survival. These projects are facilitated by the use of Coded Wire Tags (CWT). Coded wire tags are small (2-3mm long) micro tags that are injected automatically by a CWT device into the snout cartilage of anaesthetised fish remaining there for the duration of the life of the fish. CWT fish also have their adipose fin (small fin between the dorsal fin and caudal fin (tail fin)) removed so that they can be identified in the various fisheries that may intercept them. In Ireland a comprehensive screening programme is conducted at all major landing ports and markets. This programme is important in monitoring the effect of the remaining salmon fisheries on salmon stocks from rivers both within and outside of the island of Ireland.

Trends in marine survival for the River Bush (nearest index river to the Foyle system) confirm patterns observed elsewhere on the southern stocks of North Eastern Atlantic salmon, which indicate that marine survival can be variable between stocks and years. In the River Bush marine survival has decreased considerably over recent years as outlined in Table 4.

Year of Smolt Cohort	Year of Returning 1SW Grilse	Marine Survival %
Pre 1996	Pre 1998	Circa 30%
2002	2003	5.9
2003	2004	4.3
2004	2005	4.6
2005	2006	4.2
2006	2007	13.0
2007	2008	7.5
2008	2009	3.3

Table 4 Marine survival rates for the River Bush of 1SW grilse (after exploitation at sea) pre 1996 and 2002-2008 smolt cohort. Data supplied by Agri Food and Bioscience Institute, River Bush Salmon Research Station

The figures outlined in table 4 are mirrored by those for other index rivers monitoring the southern stocks of North Eastern Atlantic salmon populations. These figures suggest that salmon are facing increased pressure for survival at sea. A major new international research project called SALSEA - Merge has been developed by scientists from the North Atlantic Salmon Conservation Organisation (NASCO) parties and its research wing the International Atlantic Salmon Research Board (IASRB). There are twenty consortium members in total including the Loughs Agency. SALSEA aims to monitor how Atlantic salmon use the ocean; where they go; how they use ocean currents, and the ocean's food resources, and what factors influence migration and distribution at sea. Research cruises commenced in 2008 and continued in 2009 to collect the necessary data to answer the questions listed above. In 2008 426 post smolts were caught by the two Irish cruises and 363 post smolts caught by the Faroese in the areas highlighted below. In 2009 464 post smolts were captured during the two Irish Research cruises which concentrated on the continental shelf edge to the north west of Ireland and on the North Norwegian sea. Further information and project details can be found at:

<http://www.nasco.int/sas/salsea.htm>

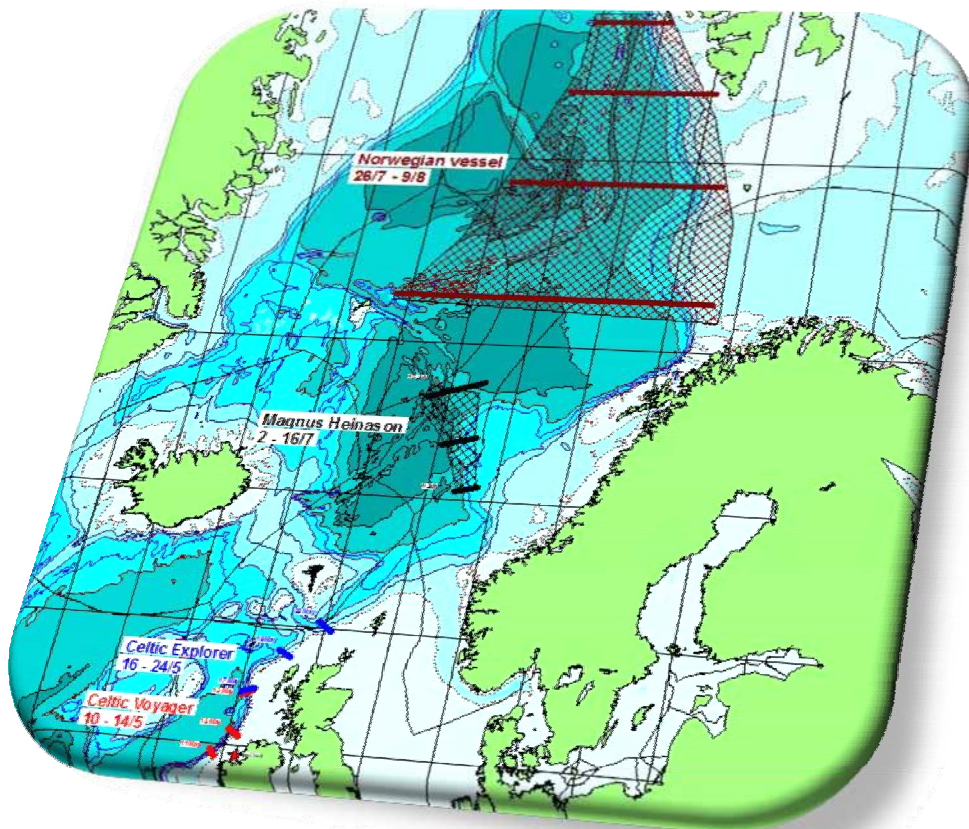


Fig 4 Marine survey areas for salmon in 2008

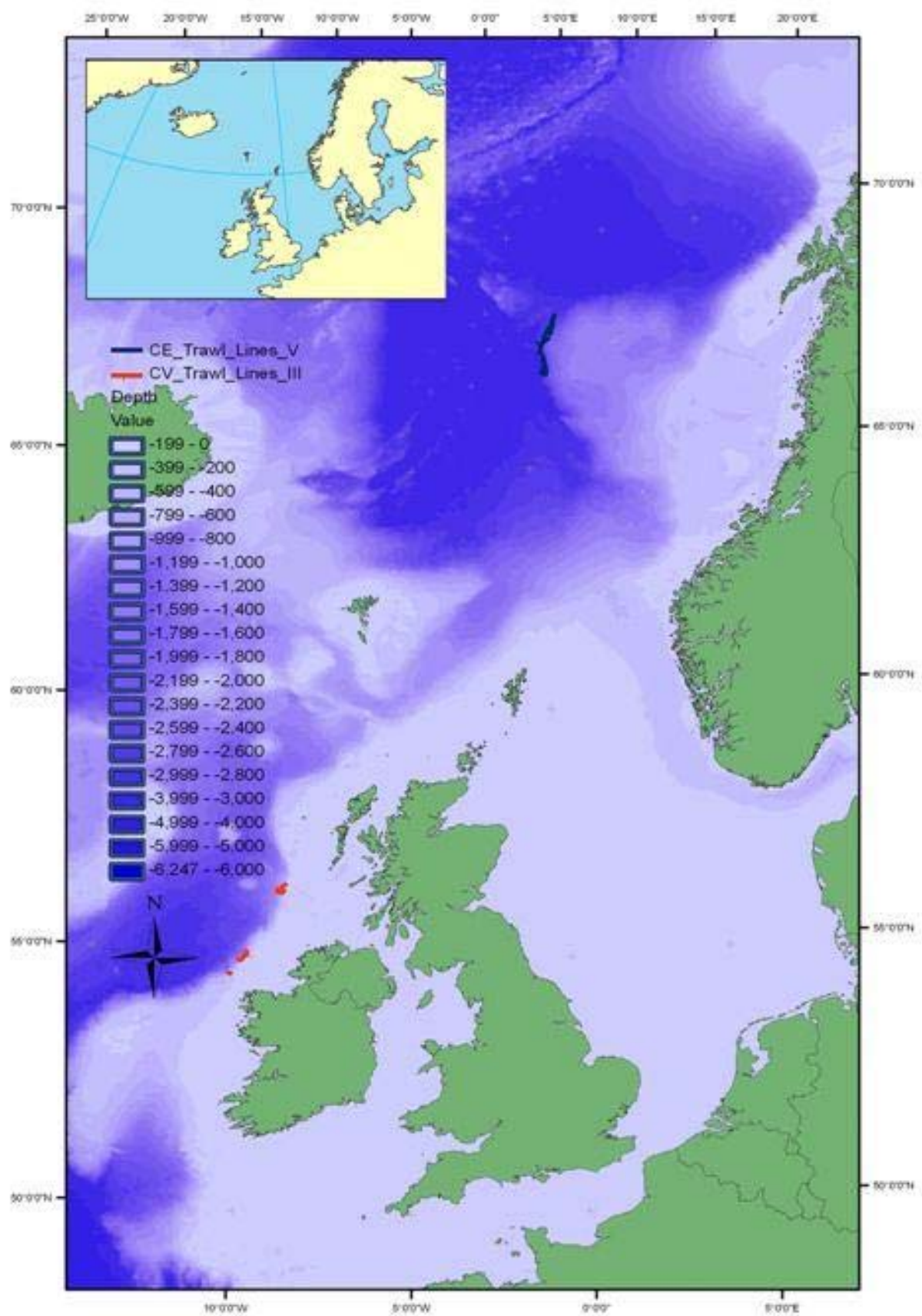


Fig 4.1 Marine survey areas for salmon in 2009



Fig 4a RV Celtic Explorer SALSEA research cruise



Figure 4b Picture from the Irish Research Vessel Celtic Explorer taken during the second SALSEA research cruise 16-24th May 2008

Since 2003 partial smolt trapping including CWT tagging has been conducted in the Faughan catchment using a rotary screw trap, Fig 4c.



Figure 4c Rotary screw trap in position on the River Faughan directly below the fish pass at Campsie barrage.

Smolt trapping can have a number of objectives including the monitoring of both salmonid and non salmonid species. Sampling of the age composition, obtaining information on run timing and recording length/weight data is conducted in tandem with the tagging programme. As mentioned above total counts of migrating smolts can be made on rivers. Where this is unfeasible due to the absence of total trapping facilities, total smolt migration can be estimated by means of a mark-recapture experiment.

In 2004 an estimate of total smolt production for the Faughan catchment was made by a mark-recapture study resulting in a minimum run size estimate of 33,854 migrating salmon smolts. The estimate was a minimum due to a number of high water events that prevented the smolt trap from fishing for a period of time during the peak smolt migration period. Tables 4.1 and 4.12 outline numbers of salmon smolts tagged from 2003-2008 and recapture data for 2003 and 2004.

Year	No of Salmon Smolts Tagged	Average Length (mm)	Average Weight (g)
2003	2113	149	33.45
2004	2500	134	24.6
2005	2210	133	23.6
2006	1025	133	25.36
2007	2062	135	27.1
2008	1865	130	22.1
2009	561	134	24.4

Table 4.1 Numbers and average weight and length of salmon smolts tagged on the River Faughan 2003-2009. Coded Wire Tagging equipment was purchased by the Loughs Agency in 2005 with funding secured from the European Regional Development Fund through the INTERREG IIIA Programme, administered by the Environment and Heritage Service, on behalf of the Department of Environment.

Year Tagged	Year Recaptured	Numbers Recaptured	Recapture Location
2003	2004	12	Greencastle, Burtonport, Malin Head, Belmullet and Torr Head
2004	2005	16	Greencastle, Malin Head, Donegal and Galway Bay
2005	2006	3	Greencastle
2006	2007	2	Greencastle and Ballycastle
2007	2008	2	Greencastle

Table 4.12 Recapture data from River Faughan CWT programme. Data for fish tagged in 2008 and recovered in 2009 will not be available until 2010.

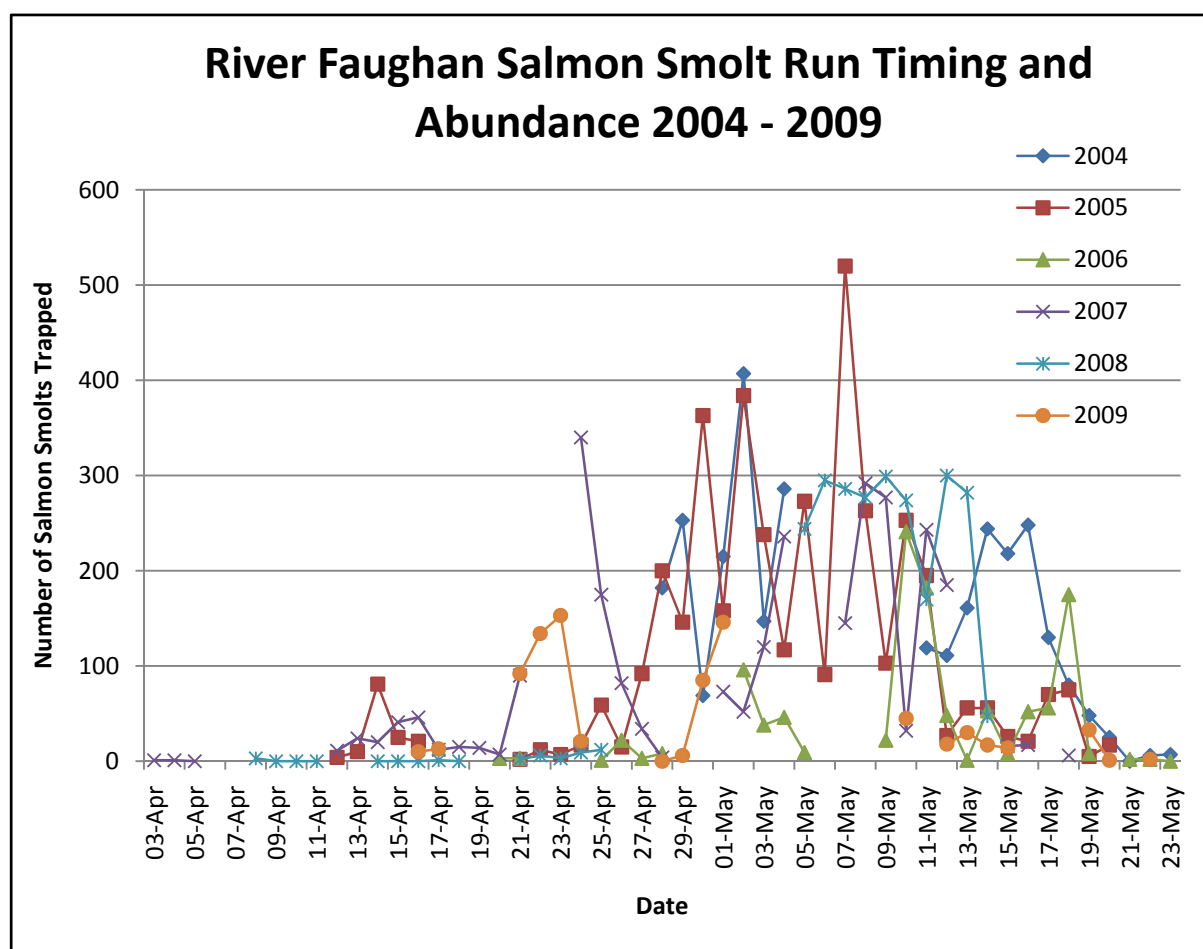


Figure 4d Salmon smolt run timing and abundance from rotary screw trap sub sample, River Faughan 2004-2009. Breaks in data are due to closure of trap during high water conditions.

In 2004 a detailed examination was carried out on the age class of migrating salmon smolts in the Faughan catchment, Table 4.13.

Age at Smolting	%
1	13
2	83
3	4

Table 4.13 Age class of salmon smolts migrating from the Faughan catchment in 2004



Fig 4.14. From top to bottom, Atlantic salmon smolts from the Faughan Catchment, brook lamprey, river lamprey and sea lamprey also caught in the River Faughan smolt trap

5.0 ADULT ABUNDANCE

Adult Atlantic salmon abundance is assessed in three ways: directly by using commercial netting/recreational rod catches and fish counters and indirectly by reference to conservation limits/spawning targets.

Using catch data as a measure of population status is a well established and extensively used technique. In the Foyle system annual commercial and recreational catch data has been recorded since the establishment of the Foyle Fisheries Commission in 1952, with some data available before this period. The relationship between catch and stock is complex and care should be applied in interpretation. A more precise measure of catch incorporates fishing effort (number of licences issued or the amount of time fished) and is referred to as catch per unit effort (CPUE).

5.1 Recreational Fisheries

One problem encountered when analysing catch data is unreported catch. All recreational fishers are required by law to make catch returns. This information facilitates management decision making and therefore it is vitally important that all catch returns are accurate and made promptly at the seasons end.

Year	Declared Rod Catch Salmon	Declared Rod Catch Sea Trout	Returns as a % of Licences Issued
1999	1022	679	3.74
2000	723	417	2.55
2001	3188	450	17.68
2002	5117	1010	27.93
2003	1844	361	15.5
2004	2285	75	13.99
2005	4084	413	25.77
2006	3476	469	37
2007	4929	379	22.11
2008	4060	815	54.94
2009	2923	*550	43.88

Table 5 Declared rod catch returns for salmon and trout in the Foyle and Carlingford areas. Note figures include the Clanrye and Whitewater in the Carlingford area from 2001 onwards. Carcass tagging was introduced in 2001.*Denotes all trout.

|

Salmon Rod Catch 1952 - 2009

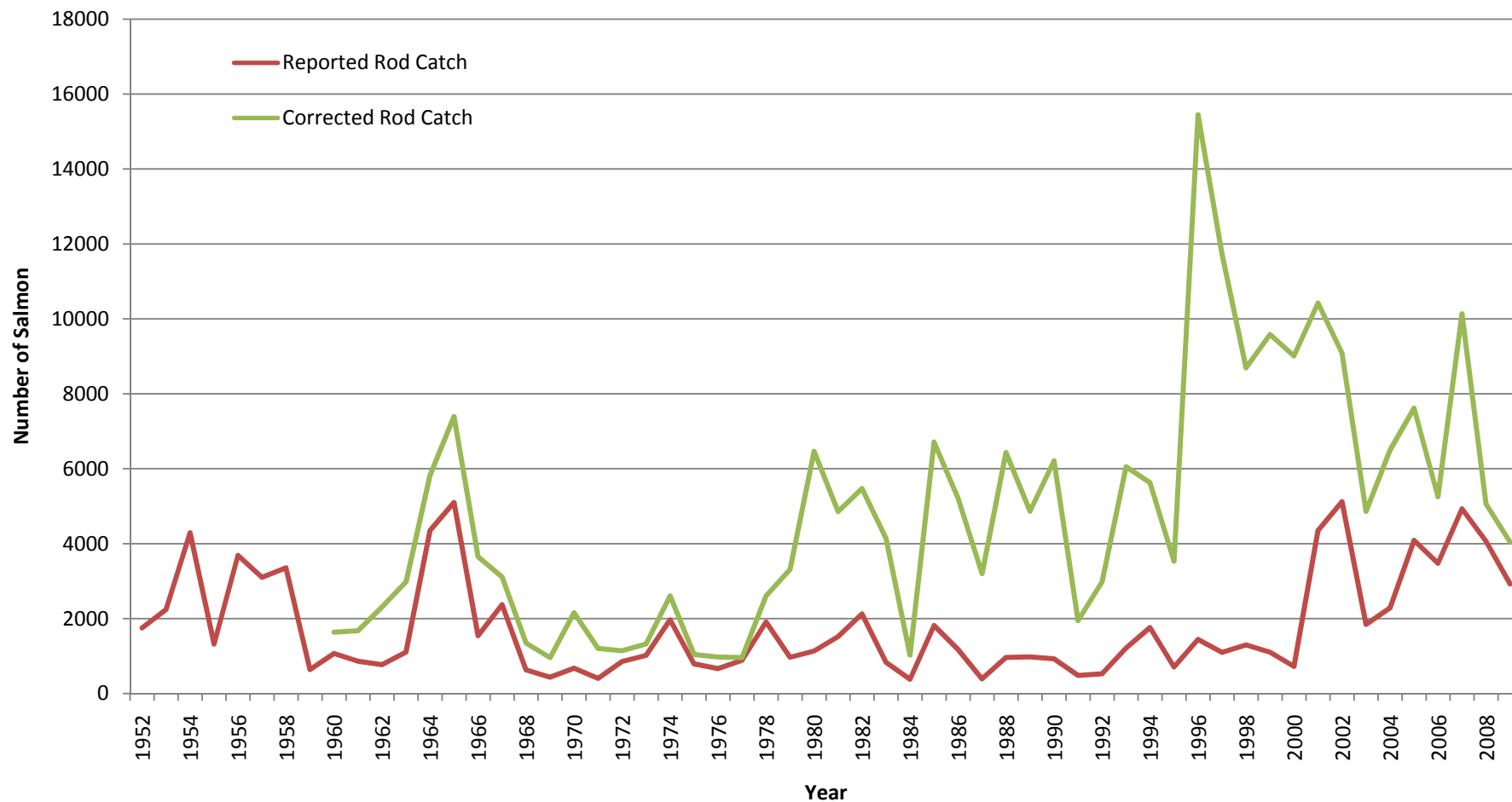


Table 5.1 Salmon rod catch

Year	Declared Catch Derg Catchment Salmon	Declared Catch Derg Catchment Sea Trout
2002	614	14
2003	156	3
2004	84	0
2005	324	6
2006	157	10
2007	310	7
2008	260	35
2009	147	2

Table 5.11 Declared catch from the Derg catchment for salmon and sea trout 2001-2009



Fig 5.1 Angler on the upper reaches of the Faughan River

5.2 Commercial Fisheries

Commercial fisheries have traditionally operated within the Foyle sea area, Lough Foyle and tidal River Foyle. The drift net and draft net fisheries as well as the rod fisheries have been closely regulated with a real time management regime in place to monitor the numbers of fish migrating up key rivers. If predetermined numbers of fish have not been counted by the strategically placed electronic fish counters at Sion Mills weir (River Mourne), Campsie Barrage (River Faughan) and the Plumb Hole (River Roe) then specified closures of the commercial and/or recreational fisheries are enforced.

In 2007 new regulations were introduced to reduce the number of commercial nets operating within the Foyle area and all mixed stock interceptory drift nets seaward of Lough Foyle were curtailed. This decision was made to comply with the EU Habitats Directive, similar curtailment of mixed stock fisheries were introduced in the Republic of Ireland. Within the Foyle area this was achieved through a voluntary hardship scheme. 18 out of 112 drift nets remain in Lough Foyle, those remaining have been reduced in size from 900m to 500m and 10 out of 50 draft nets remain. This represents a significant reduction of netting effort. Regulations were also introduced to limit the numbers of fish which could be retained by the recreational rod fishery throughout the Foyle and Carlingford areas.

Year	Drift Catch	Draft Catch	Total Drift and Draft
1998	31296	11141	42437
1999	15397	7893	23290
2000	22333	10339	32672
2001	13500	9476	22976
2002	28851	11917	40768
2003	15741	16991	32732
2004	12800	9490	22290
2005	13391	12143	25534
2006	6145	6031	12176
*2007	2598	2774	5372
2008	1248	2916	4164
2009	611	1326	1937

Table 5.2 Declared catch from the commercial salmon fisheries 1998-2009. Note 100% rate of catch returns. * Reduced numbers of commercial nets operating in the Foyle area from 2007



Fig 5.21 Commercial Fishing. Draft netting on the tidal River Foyle and drift netting in Lough Foyle

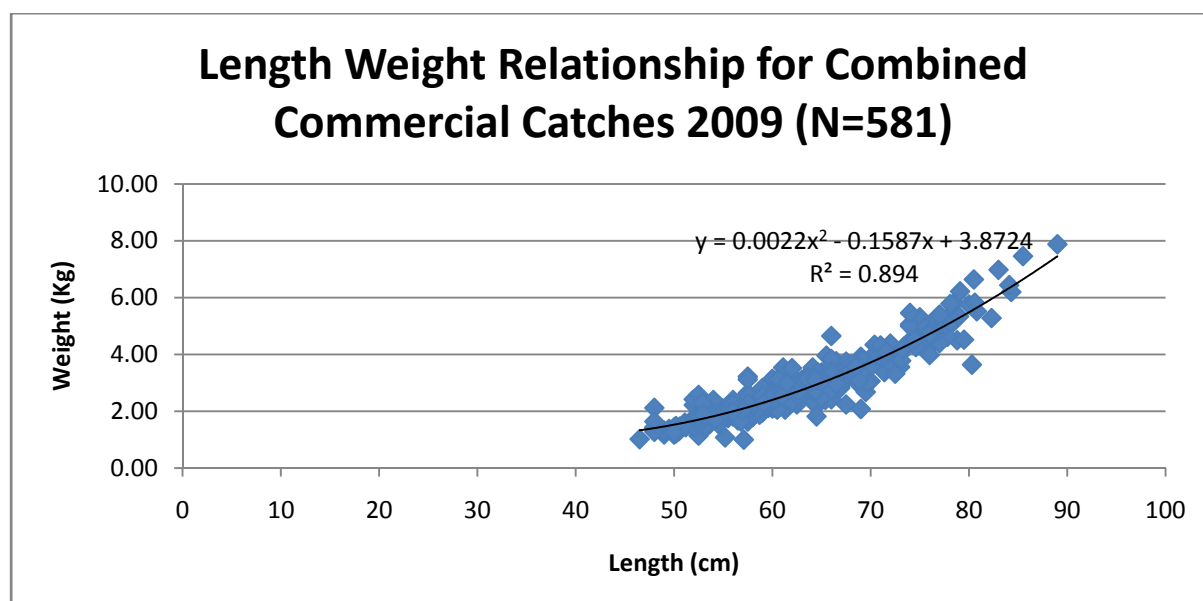


Fig 5.22 Length weight relationship for combined commercial catches in 2009

5.3 Counters

Within the Foyle system a number of river catchments have electronic fish counting facilities that provide estimates on the run timing and abundance of fish >45cm. The Derg catchment does not have a fish counter at present. In the absence of a counter the fisheries within the Derg catchment are controlled by monitoring the run timing and abundance of fish passing over the Sion Mills fish counting facilities on the River Mourne. A time series of counts for the Sion Mills fish counting station on the River Mourne is outlined in table 5.3. The Sion Mills fish counting station counts fish destined for all rivers located upstream of this point and is used to control both commercial and recreational fishing within the entire Foyle system.



Fig 5.3 Fish counting facilities at Sion Mills, River Mourne

Year	Number of fish >45cm
2002	12991
2003	12129
2004	10270
2005	9397
2006	9926
*2007	*3714
*2008	*3452
2009	8410

Table 5.3 Sion Mills fish counter figures 2002-2009. *Note low counts in 2007 and 2008 were influenced by high water levels during peak run timing during June and July. Sion Mills is a partial counter and does not cover the entire length of the weir. In high water levels as experienced in 2007 and 2008 significant numbers of fish can bypass the counting channels. Methods to reduce this are being investigated as part of the Fish Counter Programme Review, commissioned in 2008.

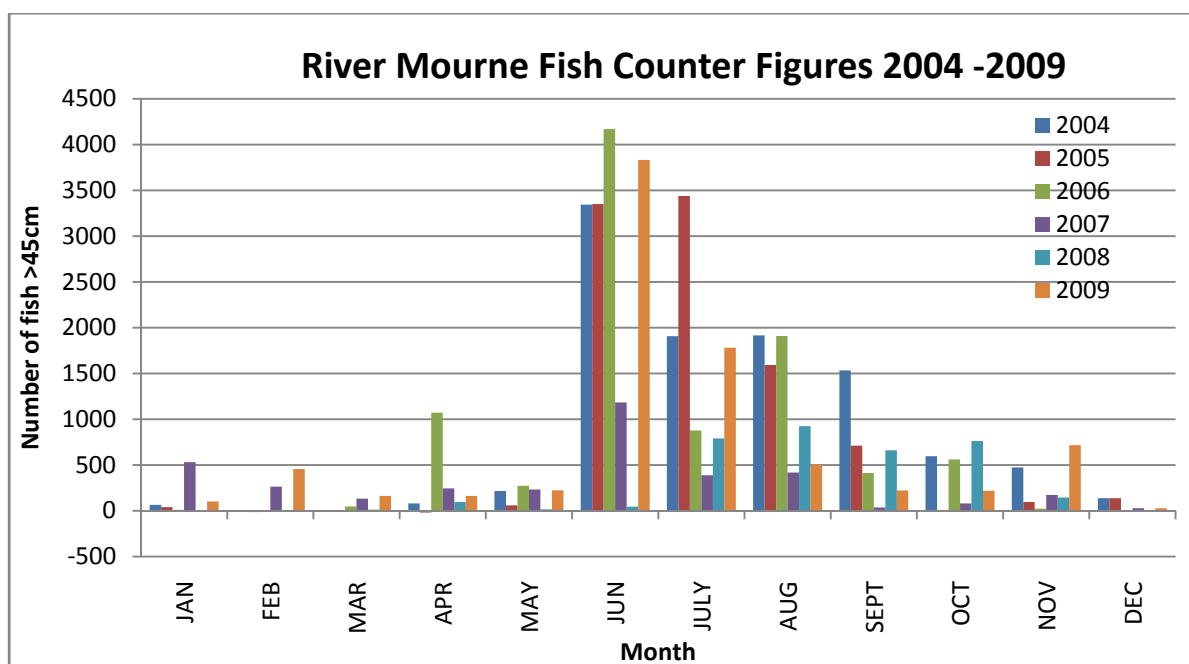


Fig 5.31 Monthly fish counts on the River Mourne 2004-2009 as recorded at Sion Mills

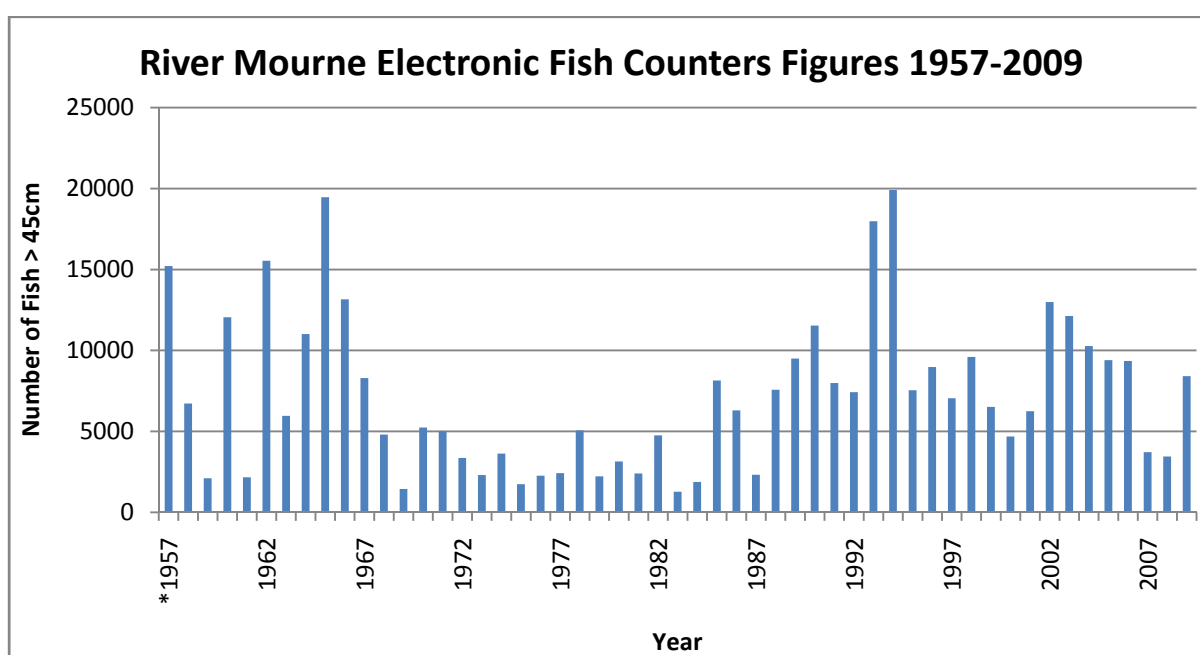


Fig 5.32 Annual fish counts on the River Mourne 1957-2007.*Note, variability in type of fish counting equipment over this period

5.4 Conservation Limits/Spawning targets

Another way to assess adult salmon stock status is to monitor run sizes on rivers and to compare them with predefined reference points called conservation limits. In the Foyle system the conservation limits define a level of spawning that optimises

the sustainable catch by commercial and recreational fisheries. If exploitation rates increase above the sustainable catch levels the catch may increase in the short-term but the stock will eventually reduce. Conservation limits demarcate the spawning stock level at which recruitment would begin to decline significantly (NASCO). The real time management regime incorporating the setting of management targets and spawning targets implemented in the Foyle aims to manage the fisheries and spawning populations in a sustainable manner. The management and spawning targets are set for the various river catchments based on the amount and quality of nursery habitat present. River habitat surveys are carried out along each stretch of river and graded according to the type and quality. Egg deposition levels are set according to the quality grading of each section of nursery habitat.

There are four grades of nursery habitat, however for the purpose of setting egg deposition levels only grades 1-3 are utilised. Grade 1 denotes the best quality habitat. The egg deposition rate/carrying capacity is set as follows. Grade 1 = 10 eggs per m², grade 2 = 5 eggs per m² and grade 3 = 2.5 eggs per m². The total number of eggs is calculated by multiplying the area of each grade of nursery habitat by the appropriate density of eggs per m². 25% is deducted from the management target allowing for loss of salmon by angling (15%) and poaching and predation (10%). The remaining figure is referred to as the conservation limit/spawning target.

Once the number of eggs required for each river has been established this can be converted to a total number of fish required to achieve the management targets and conservation limit/spawning targets. The average fecundity (number of eggs produced per female) of Foyle salmon has been estimated at 2500 and the ratio of female to male salmon estimated at 60:40. When combined with the amount of nursery habitat of the various grades this equates to the conservation limit/spawning target. A management target of 8000 adult Atlantic salmon has been set for above Sion Mills, this equates to a conservation limit/spawning target of over 6000 salmon.

Year	No of Fish Across Counter	Estimated Egg Deposition
2002	12991	14,614,875
2003	12129	13,645,125
2004	10270	11,553,750
2005	9397	10,571,625
2006	9926	11,166,750
*2007	*3714	*4,178,250
*2008	*3452	*3,883,500
2009	8410	9,461,250

Table 5.4 Upstream of Sion Mills estimated egg deposition 2002-2009. *Note 2007 and 2008 figures are minimum estimates of escapement due to high water levels resulting in the bypassing of the Sion Mills counting channels.

6.0 HABITAT MONITORING

The Loughs Agency has carried out extensive habitat surveys on all the major rivers and tributaries within the Foyle and Carlingford catchments. Habitat surveys are carried out on foot. Although time consuming this is at present the best method for classifying the various grades of habitat. Habitat is classified into one of three life cycle units Fig 6.0, the presence and order of which is essential to the productive capacity of a salmonid river. Other non salmonid species also benefit from diverse in-channel habitat. The life cycle unit categories include spawning, nursery and holding habitat. Each category is then graded on a scale of 1-4, 1 representing the best quality attainable and 4 the worst. Other data collected during these surveys include channel width and impassable barriers to migratory fish species.

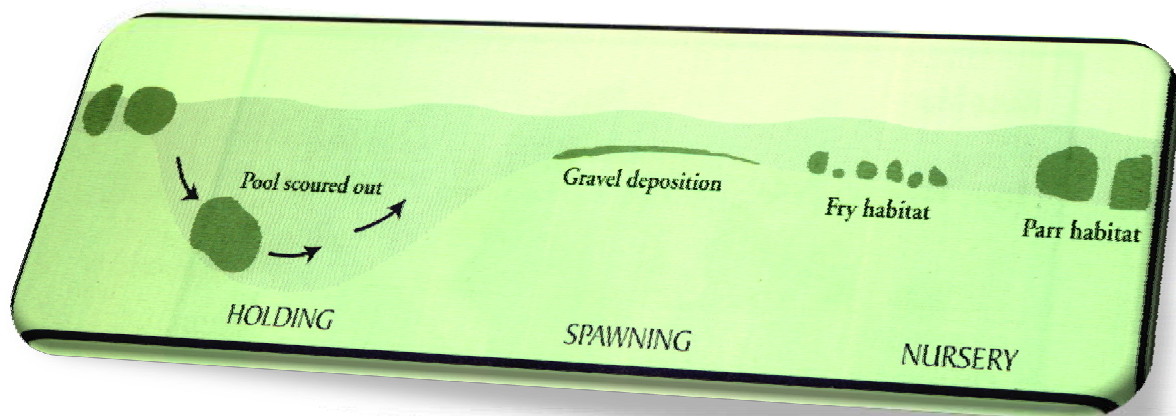


Fig 6.0 Life cycle unit depicting the type of habitat found in spawning, nursery and holding zones



Fig 6.01 Examples of spawning, nursery and holding habitat

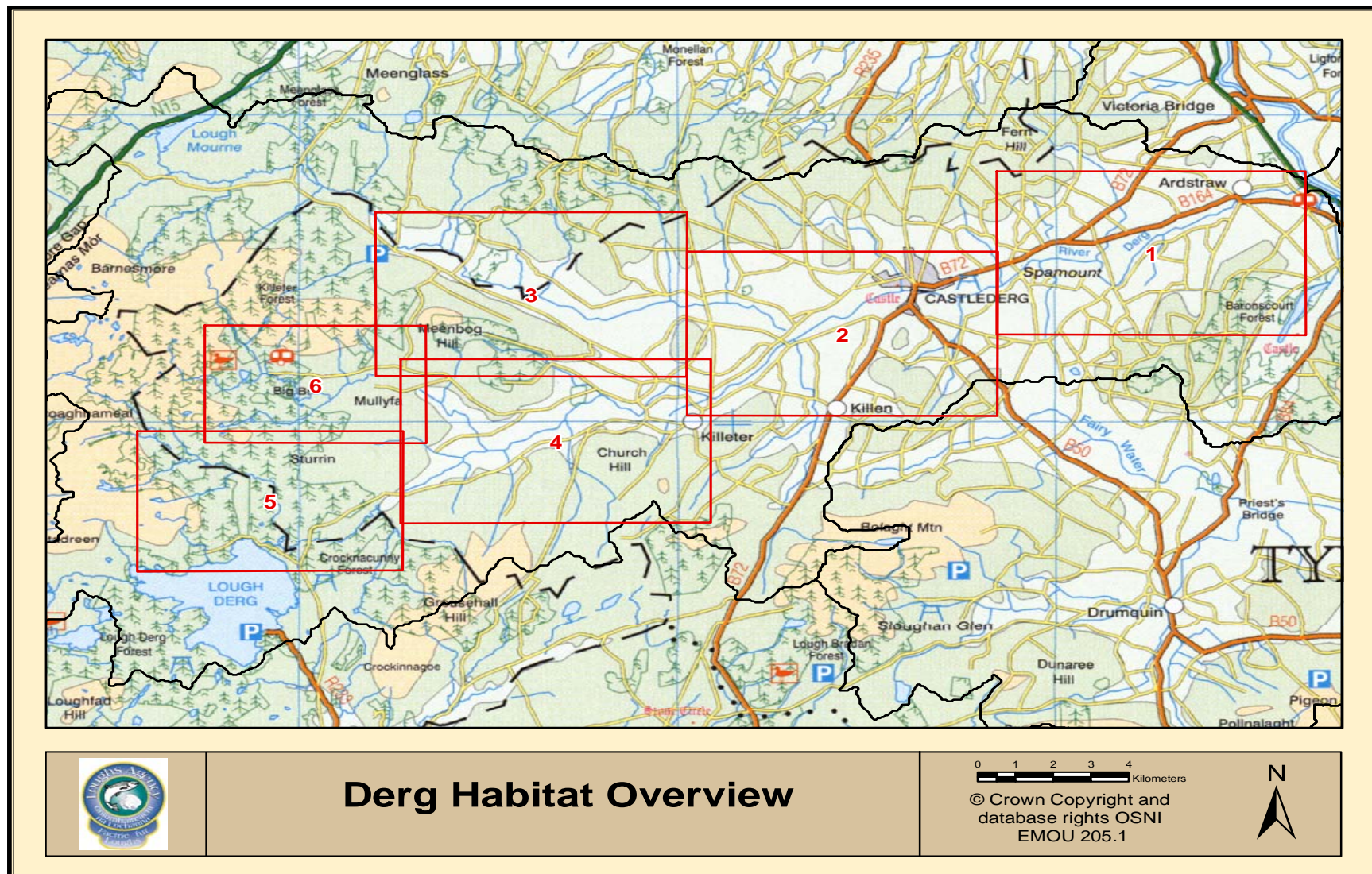


Fig 6.02 Habitat overview key for Derg Catchment

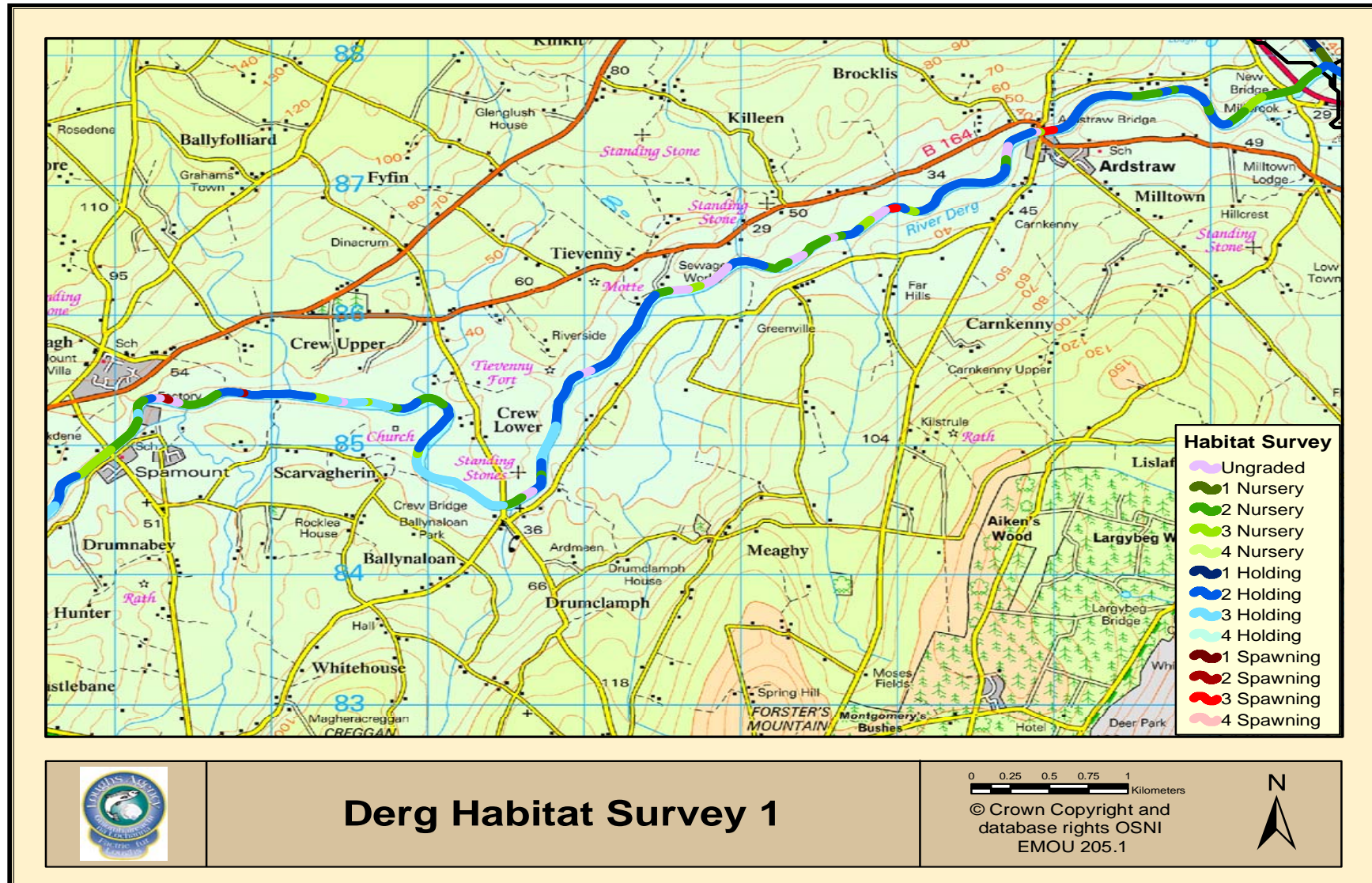


Fig 6.03 Derg catchment habitat survey map 1

June 1, 2010

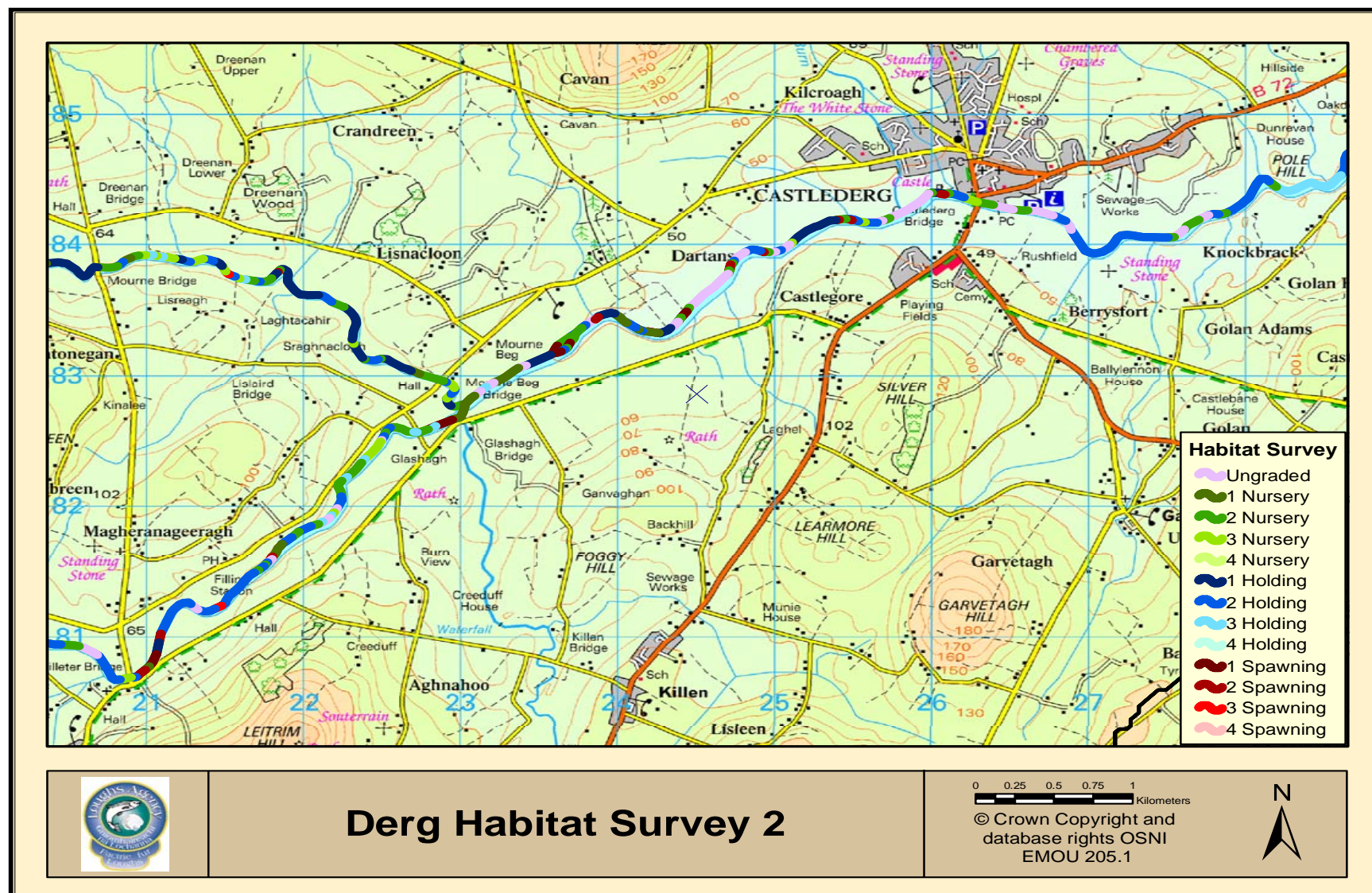


Fig 6.04 Derg catchment habitat survey map 2

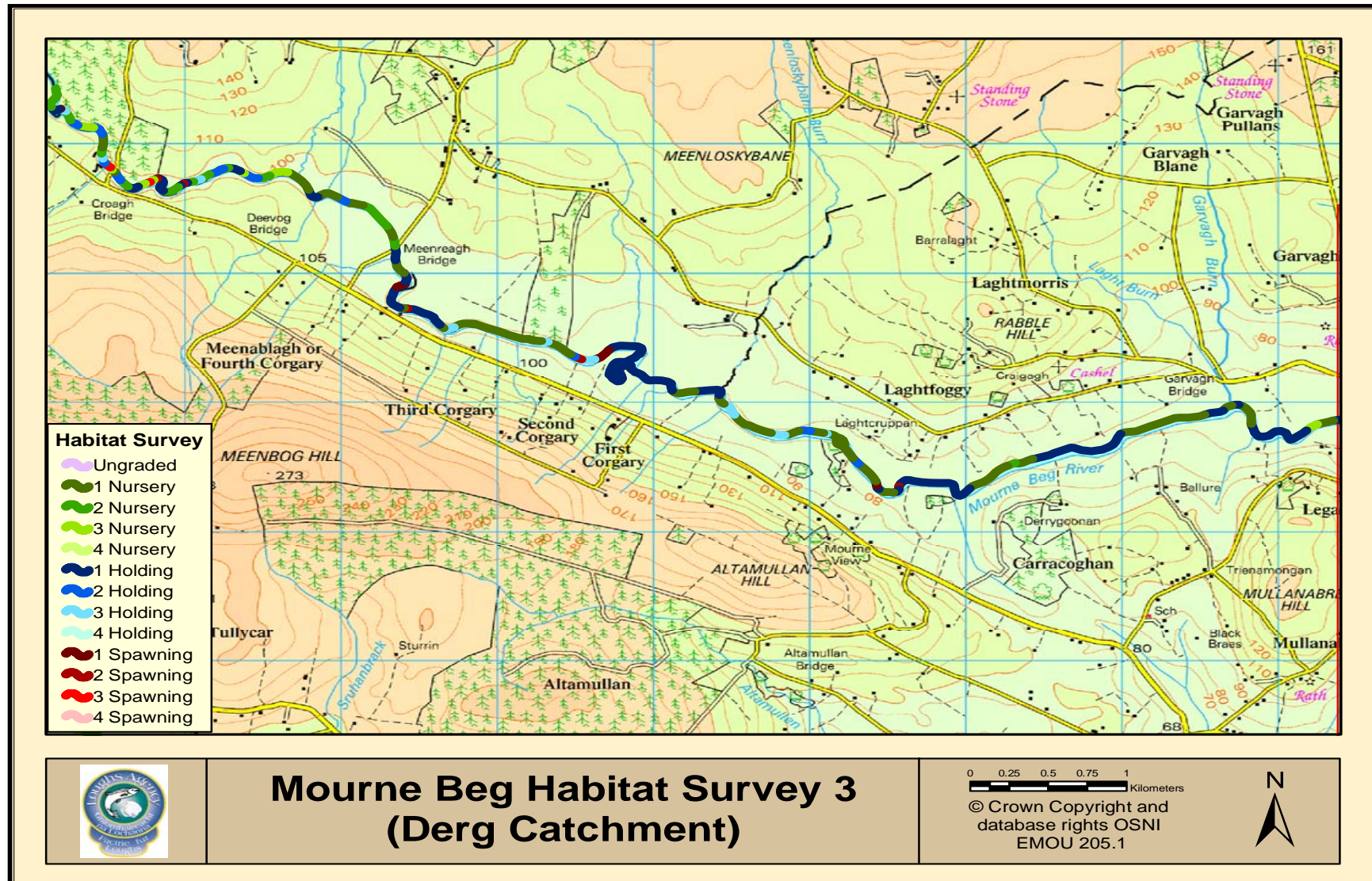


Fig 6.05 Derg catchment habitat survey map 3

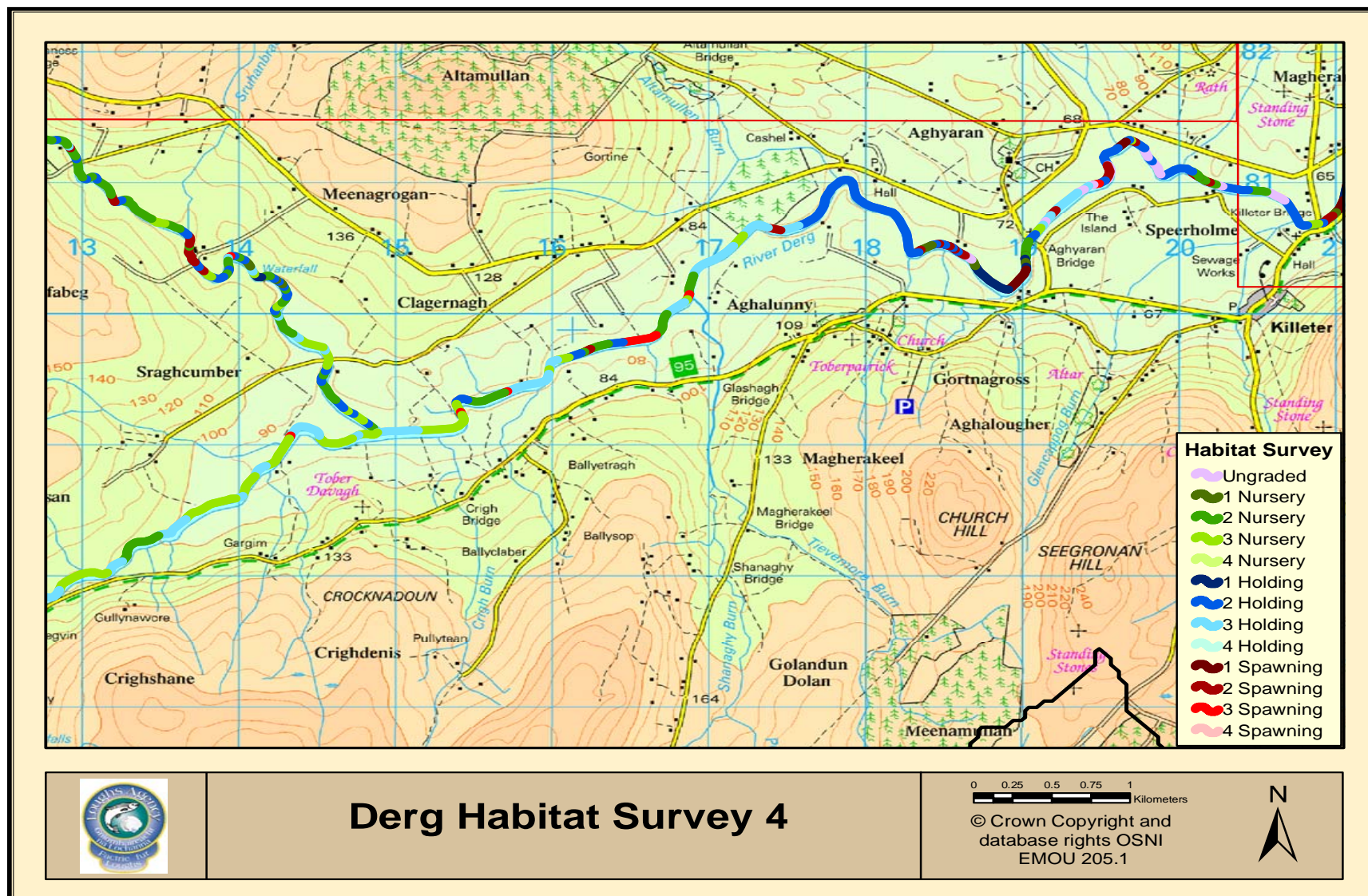


Fig 6.06 Derg catchment habitat survey map 4

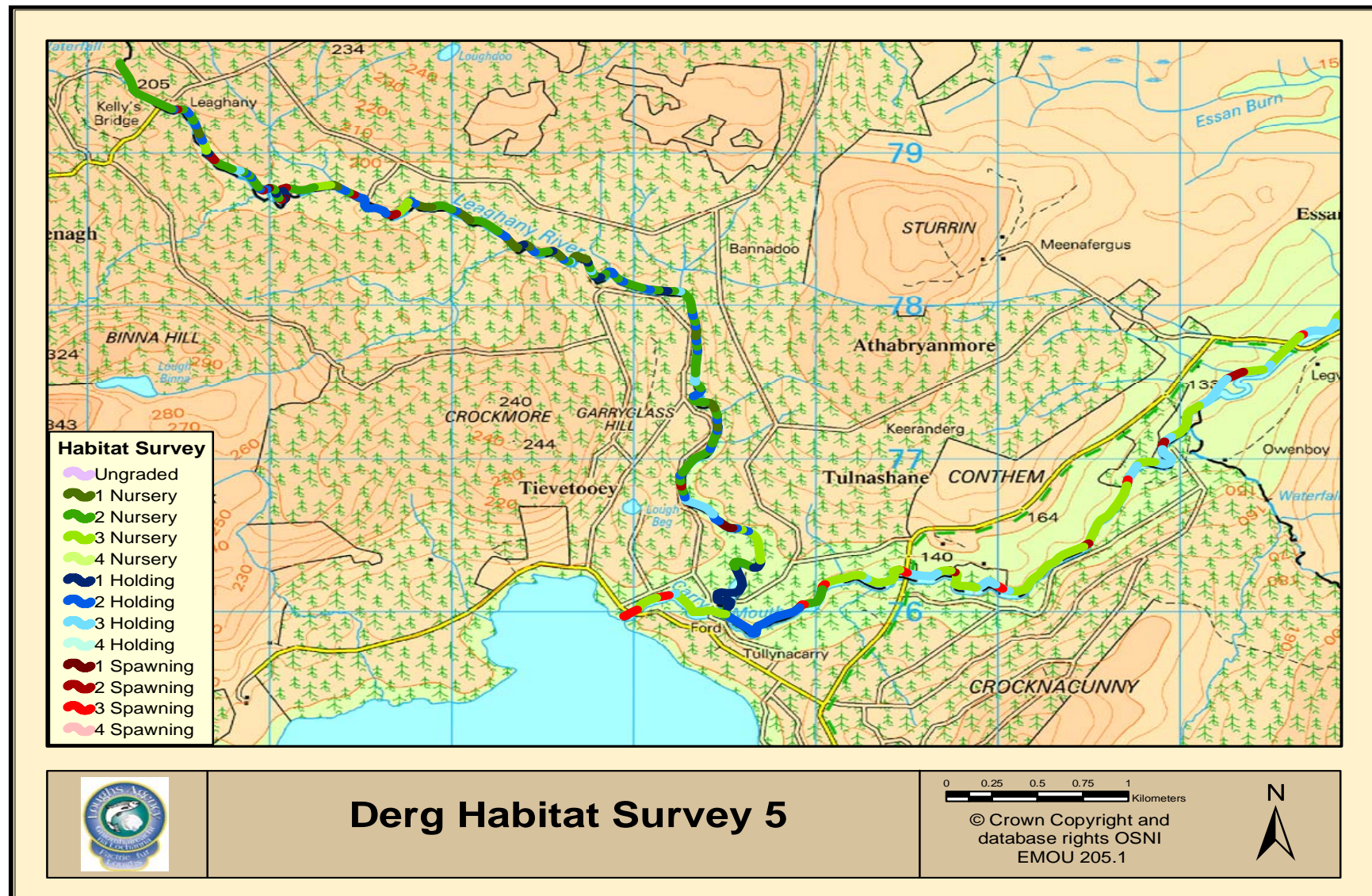


Fig 6.07 Derg catchment habitat survey map 5

7.0 LAND USE

Land use classification is an important tool when assessing the potential impacts within a particular river catchment or indeed when looking at specific land use and land management practices. Land use impacts could have either a positive or negative impact on rivers and tributaries. A good understanding of the land use within a catchment is therefore imperative in managing at a catchment scale. Land use in Northern Ireland has been captured using satellite imaging technology and classified to type. The following figures outline the broad land use classification within the Derg Catchment.

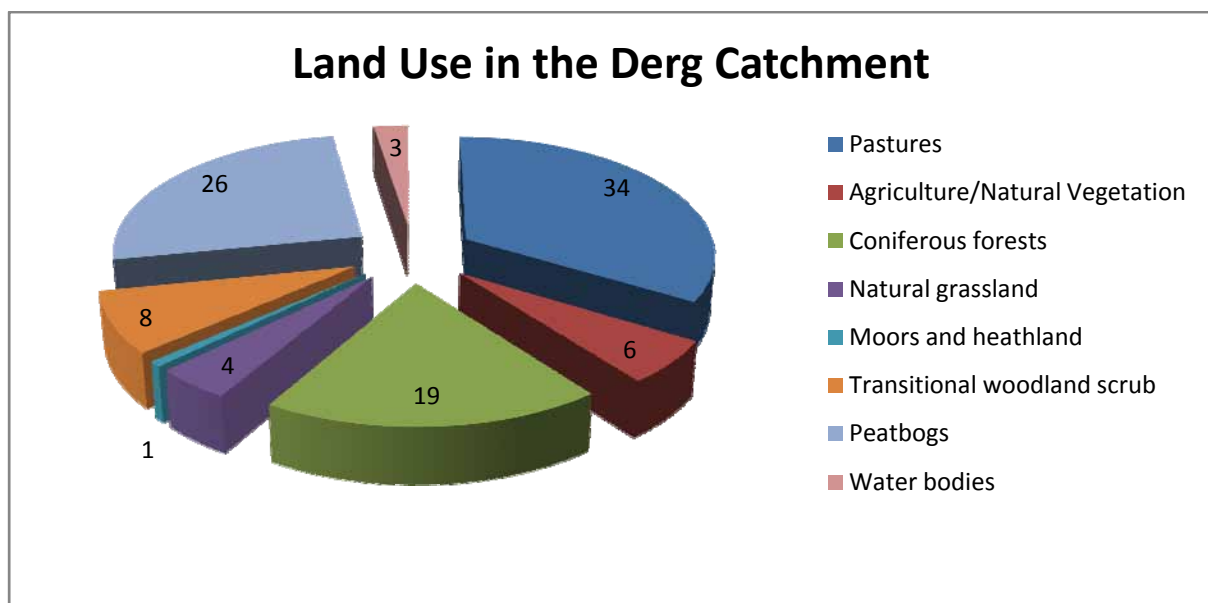


Fig 7.0 Derg catchment land use classification

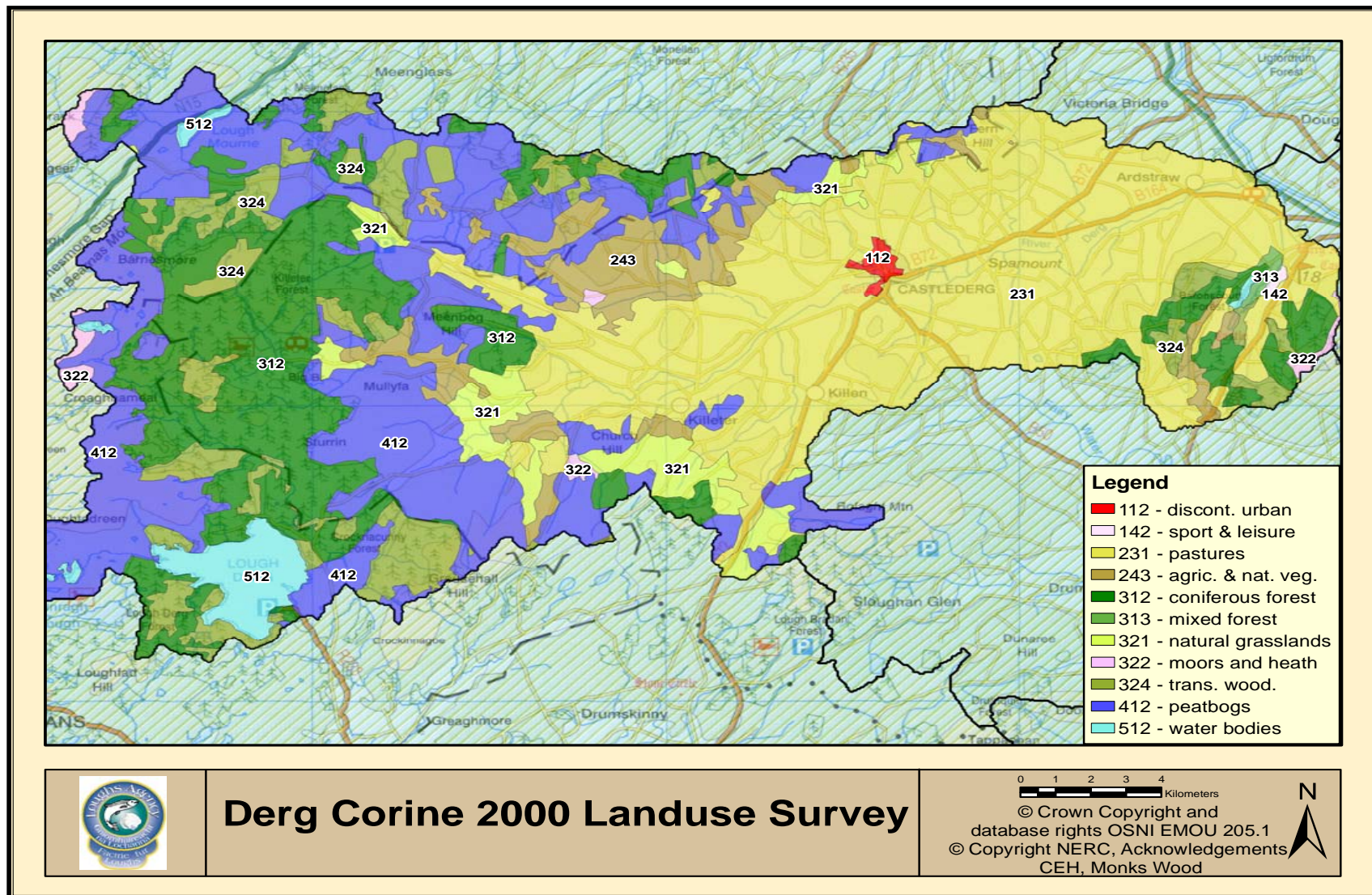


Fig 7.01. Derg catchment land use classification map

8.0 WATER QUALITY

The Northern Ireland Environment Agency (NIEA) in Northern Ireland and the Environmental Protection Agency in the Republic of Ireland are the designated competent authorities for implementation of the Water Framework Directive (WFD).

The WFD is a pan European directive designed to ensure that all waters reach good ecological status by 2015. Extensive monitoring is conducted on all water bodies to facilitate this aim.

In addition to the routine river monitoring carried out by the NIEA and the County Councils for WFD monitoring the Loughs Agency conducts proactive and reactive pollution investigations to investigate or highlight problems or potential problems which may have an effect on the aquatic environment and ultimately on the fish species and aquatic habitats.

In 2007 the Loughs Agency instigated a programme of monitoring at the tributary level for assessments of chemical and biological water quality. Four stations on tributaries of the River Derg are monitored for chemical water quality parameters including Biological Oxygen Demand (BOD), Suspended Solids, Ammonia and Phosphorous. Biological water quality was assessed using the Biological Monitoring Working Party (BMWP) a biotic scoring index.

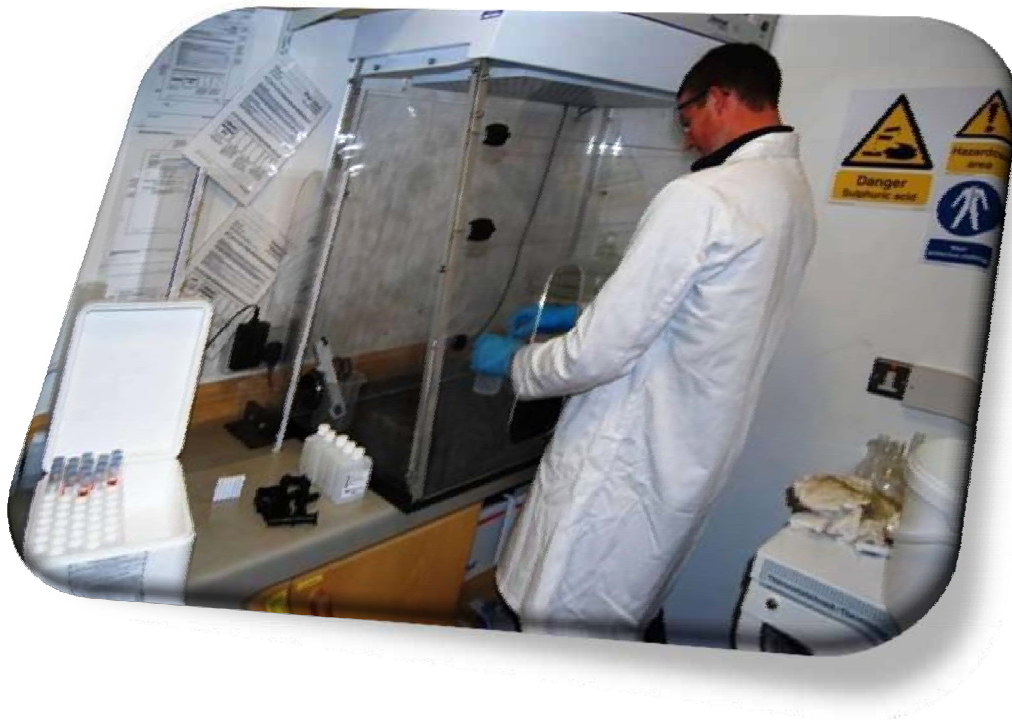


Fig 9.0 Loughs Agency chemical water quality testing in the laboratory

The Loughs Agency also maintains a mobile pollution response unit containing aerating equipment and absorbent and non absorbent booms for oil and chemical spills. The unit can be rapidly deployed to the site of a pollution incident.

Water Quality Parameters

The following water quality parameters are monitored through the Loughs Agency monitoring programme and determined from water samples in the laboratory:

- Biochemical Oxygen Demand (BOD)
- Ammonia
- Phosphorus
- Suspended Solids

BOD

Any organic matter discharged into a river provides an immediate source of food for bacteria. These bacteria will break down the organic matter eventually into simple compounds such as carbon dioxide and water. Biochemical Oxygen Demand or Biological Oxygen Demand (BOD) is a chemical procedure for determining how fast biological organisms use up oxygen in a body of water. It is considered as an indication of the quality of a watercourse

Ammonia (NH₃)

Ammonia is generally found in small amounts in rivers and streams. This is due to microbiological activity and the resultant reduction of compounds containing nitrogen. High levels of ammonia can occur as a result from sewage pollution and have detrimental impacts on fish species.

Phosphorus (PO₄)

The over-loading of nutrients such as phosphorus in watercourses often leads to a process known as eutrophication. Eutrophication is a major environmental issue in Irish rivers and lakes. Sources of phosphorus include agricultural fertilizers and household detergents.

Suspended Solids

Particulate matter may be organic or inorganic in nature. Organic solids may consist of algal growths, indicative of eutrophic conditions. Inorganic solids generally are the result of discharge washings from sand and gravel extraction activities or quarries. Suspended solids can affect plant growth and fish habitats.

The following parameters are also recorded at each sample station by means of an electronic measuring probe:

- pH
- Temperature
- Dissolved Oxygen
- Conductivity

pH

This is a measure of the hydrogen ion concentration of a solution and therefore an indication of whether a liquid is acid or alkaline. The pH scale ranges from 0 (very acid) to 14 (very alkaline), with results generally influenced by geological conditions. Fish can be susceptible to changes in pH. Low pH levels are generally found in catchments with high forestry operation impacts.

Temperature

The effect of changes in temperature on living organisms, such as fish, can be critical. Thermal discharges from urban and industrial sources can lead to temperature increases in watercourses and increased stress on aquatic habitats and associated species.

Dissolved Oxygen

Sufficient levels of oxygen saturation in fresh waters are generally an indication of good ecological status and ideal for fish life. The main point to remember about oxygen solubility is that it has an inverse relationship with temperature. This helps explain why DO levels are generally lowest during summer low flow conditions, increasing the risk of pollution from discharges at this time.

Conductivity

The conductivity or electrical conductivity of a watercourse is a measure of its ability to conduct an electric current. Electrical conductivity estimates the amount of total dissolved salts, or the total amount of dissolved ions in the water. Electrical Conductivity is controlled by geology and any variations may be sourced to increased ions from wastewater from sewage treatment plants or urban run-off from roads.

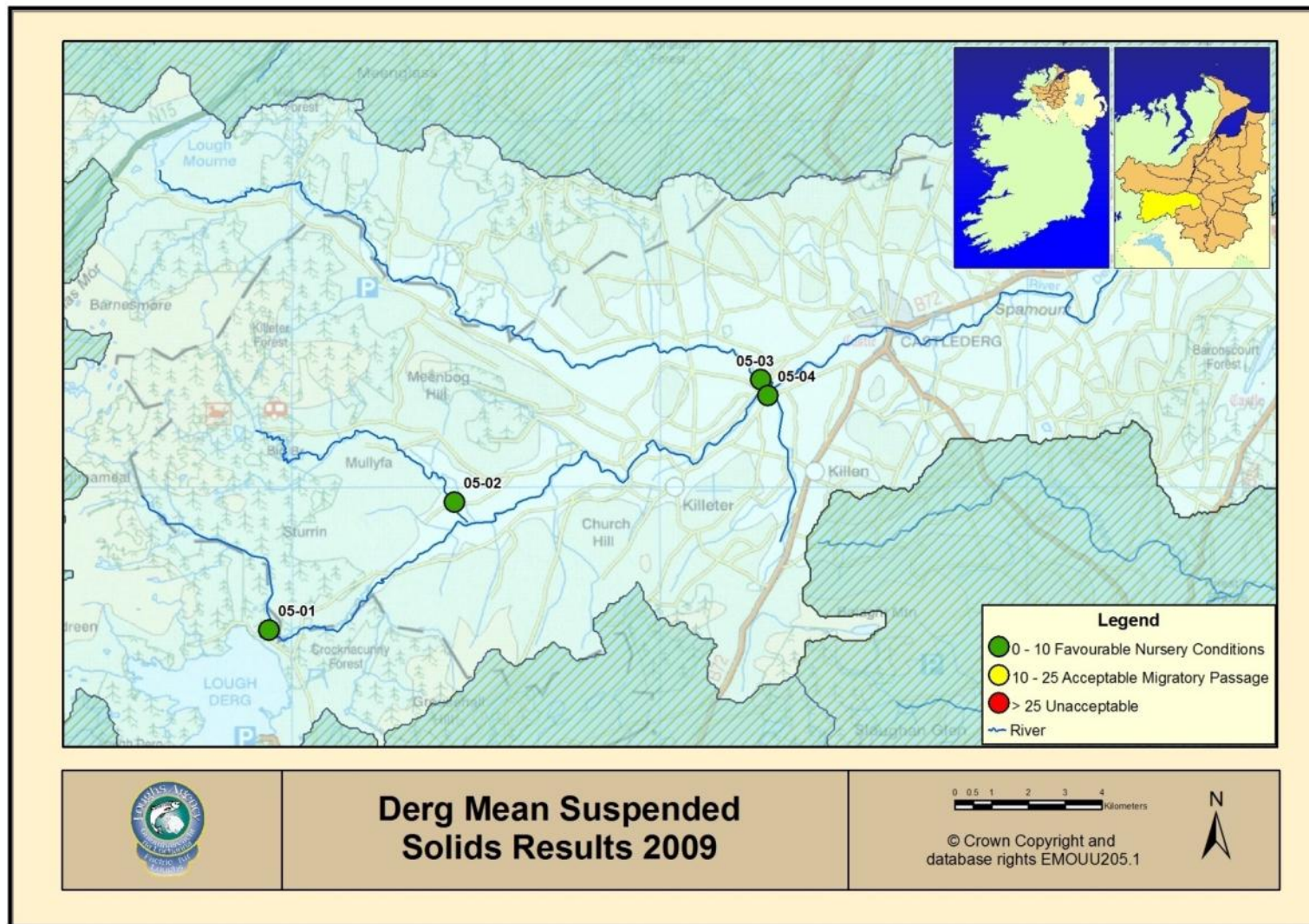


Fig 8.01 Derg catchment average suspended solids results 2009. Values are in mg/l

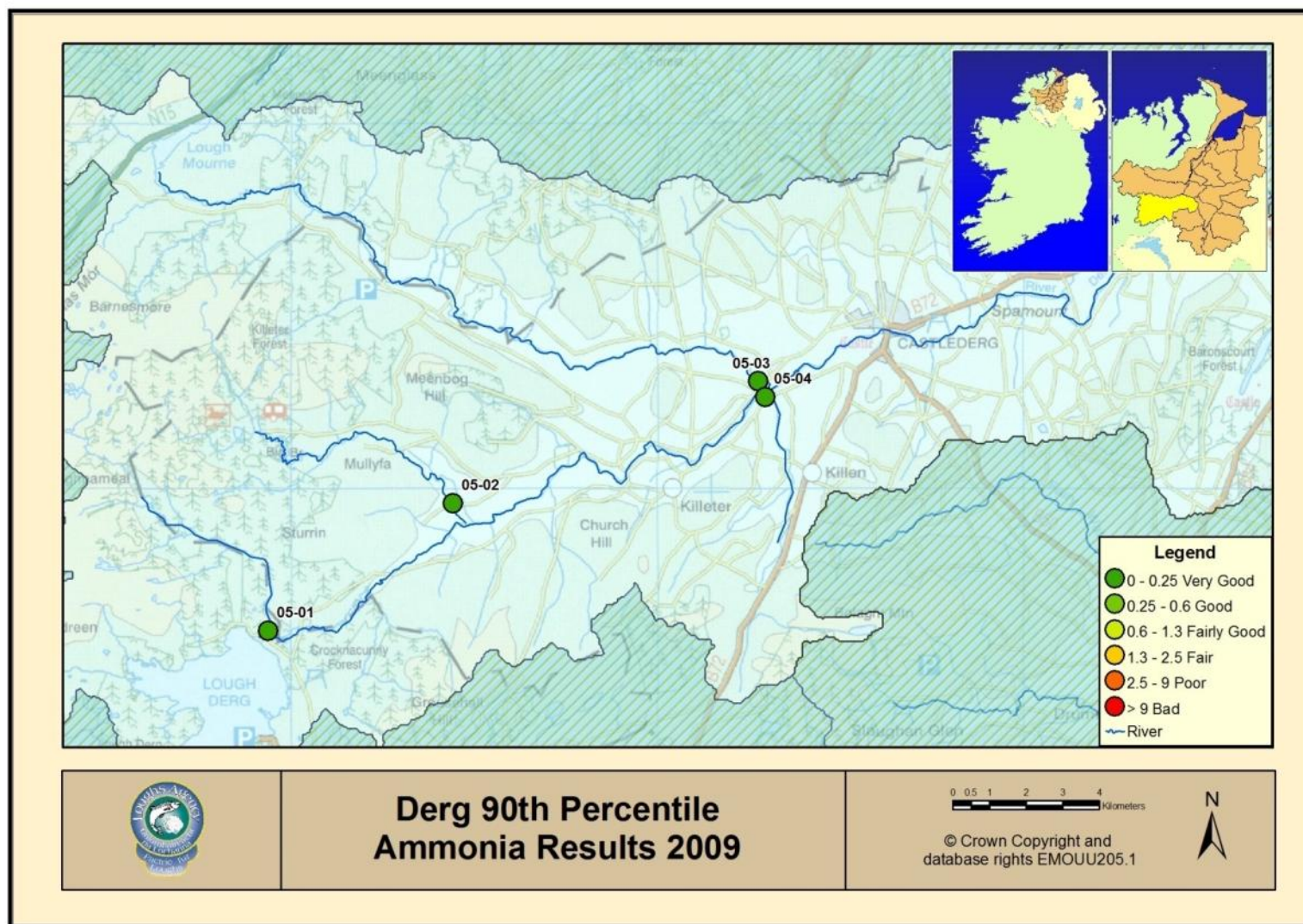


Fig 8.02 Derg catchment Ammonia results 2009. Values are in mg/l

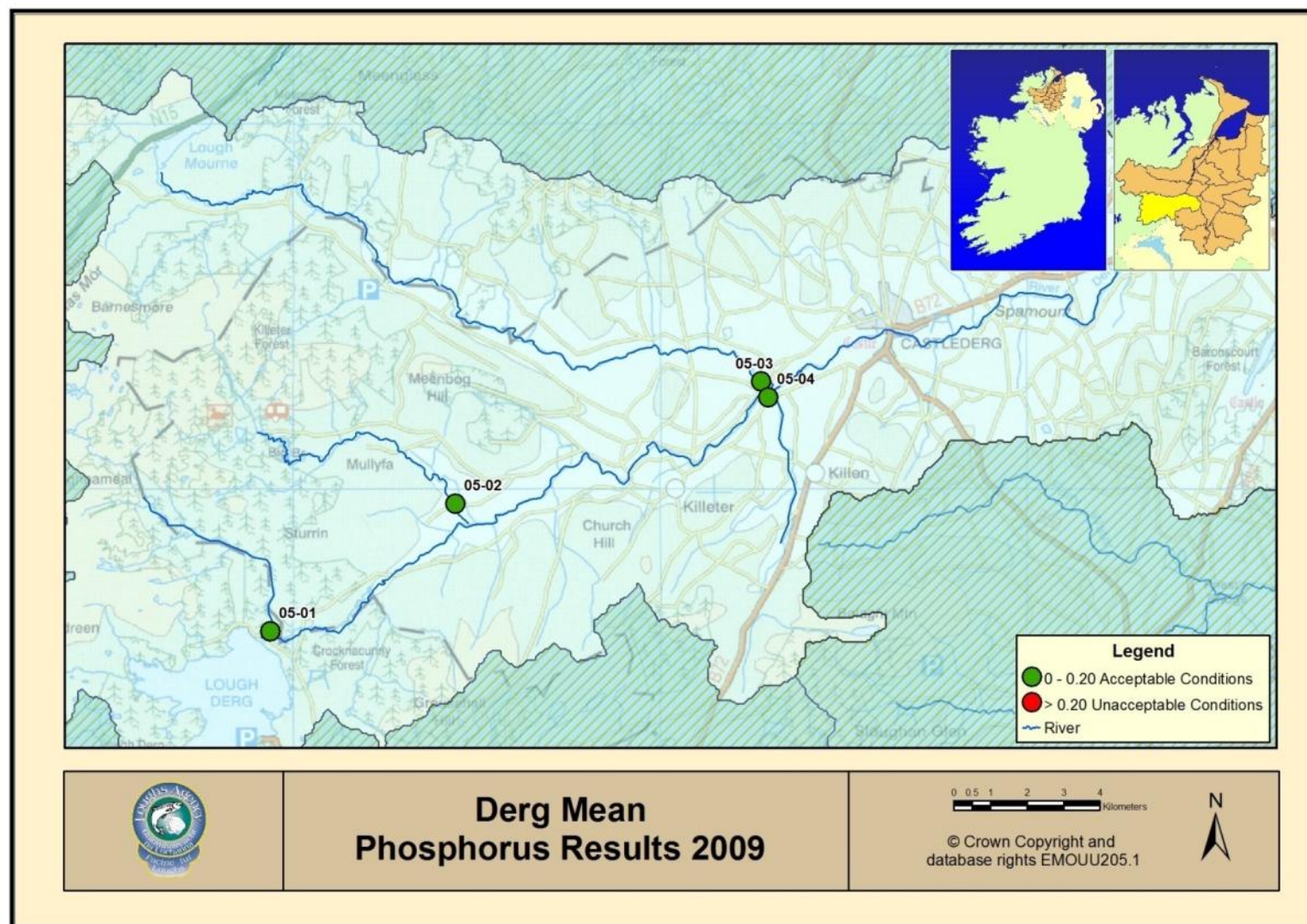


Fig 8.03 Derg catchment phosphorous results 2008. Values are in mg/l

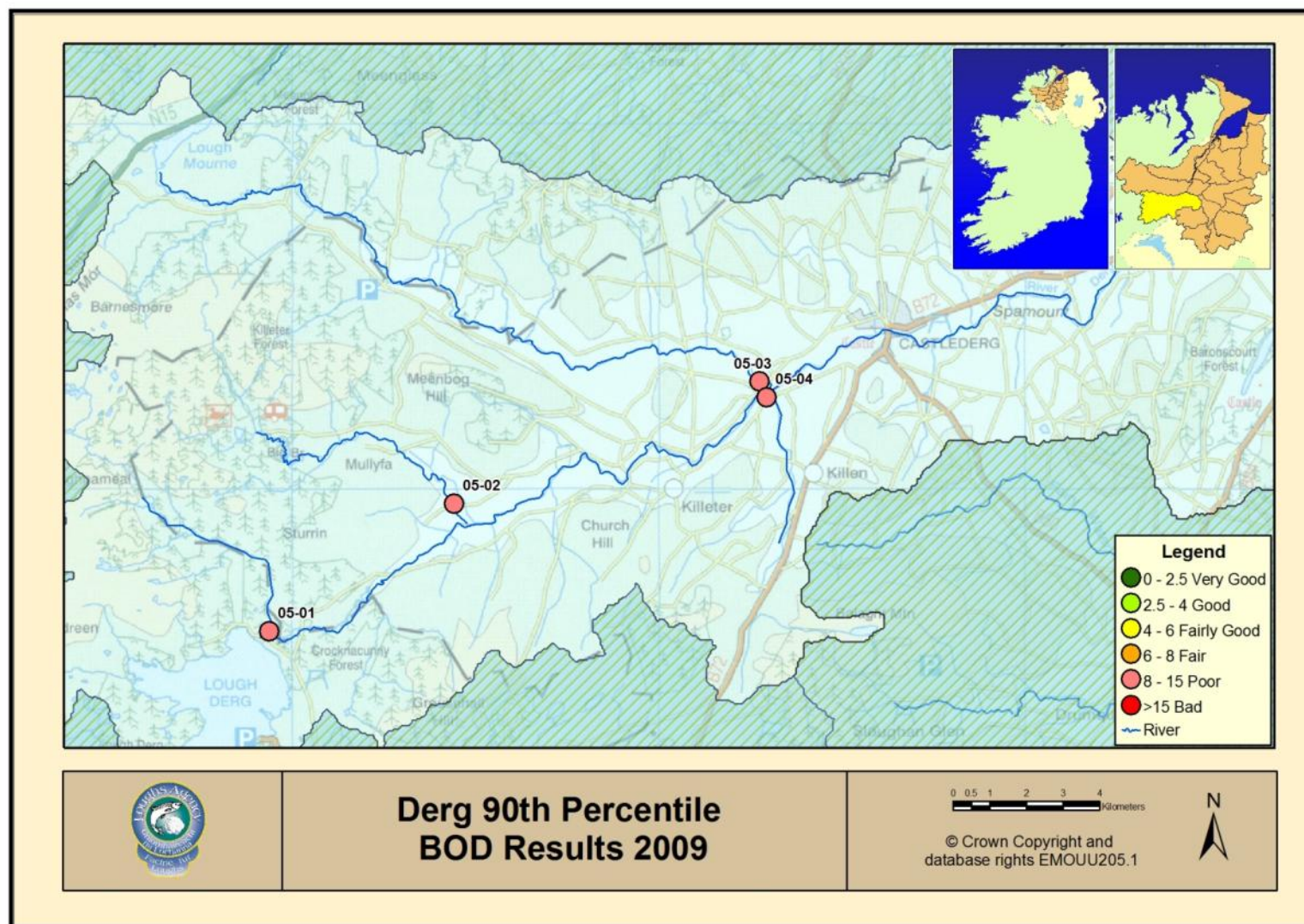


Fig 8.04 Derg catchment Biological Oxygen Demand (BOD) results 2009. Values are in mg/l

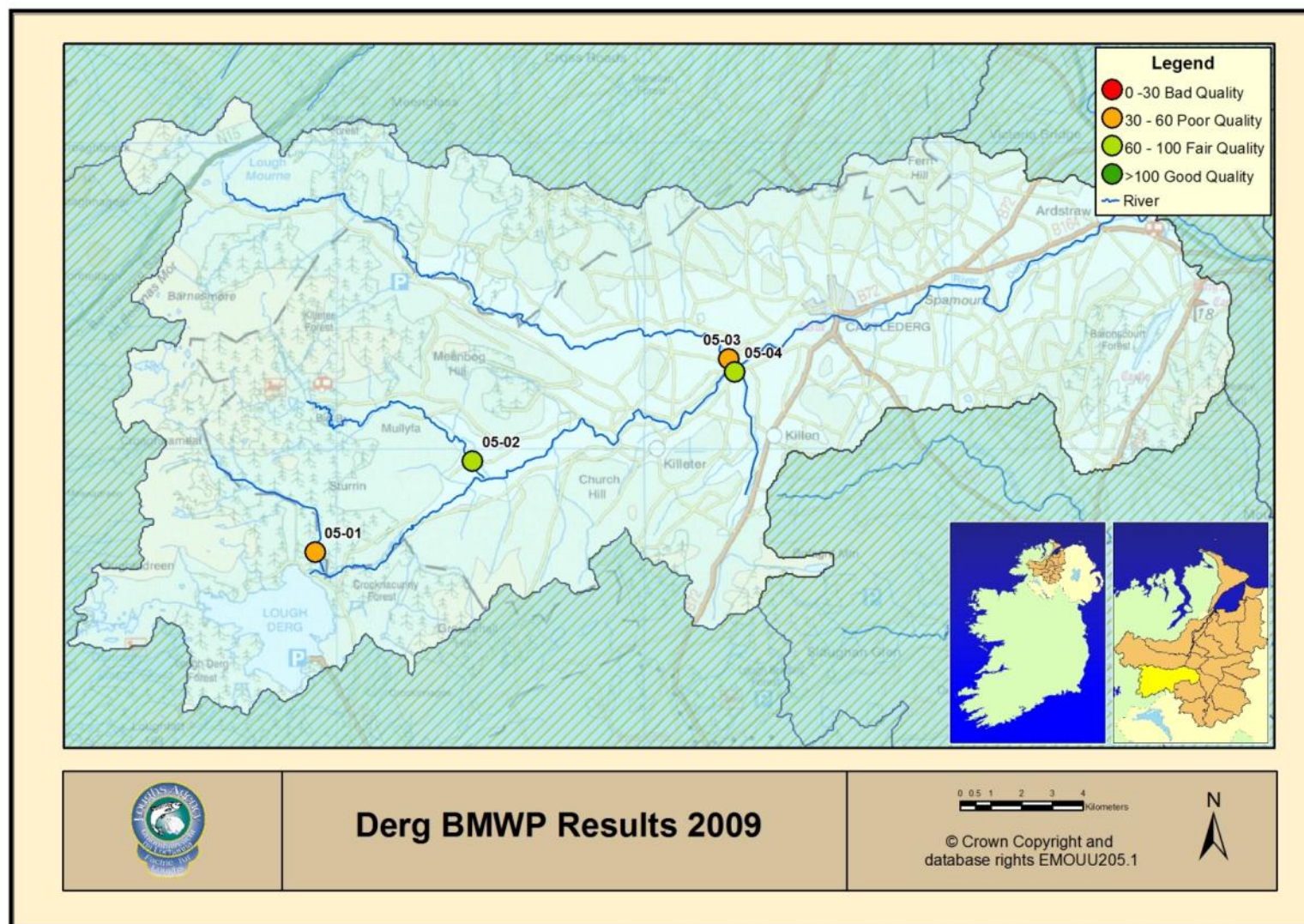


Fig 8.05 Derg catchment Biological Monitoring Working Party results 2009

Prior to 2008 NIEA employed the General Quality Assessment (GQA) system to classify and monitor the chemical and biological water quality of the rivers of Northern Ireland. With the implementation of the Water Framework Directive a new approach to freshwater classification has been adopted following the United Kingdom Technical Advisory Group (UKTAG) guidelines developed for WFD implementation.

An overall classification status for a water body is obtained by the amalgamation of biological, chemical and physical elements. Fig. 8.06 details how these elements combine to create ecological and chemical statuses which are then combined to create the overall surface water status.

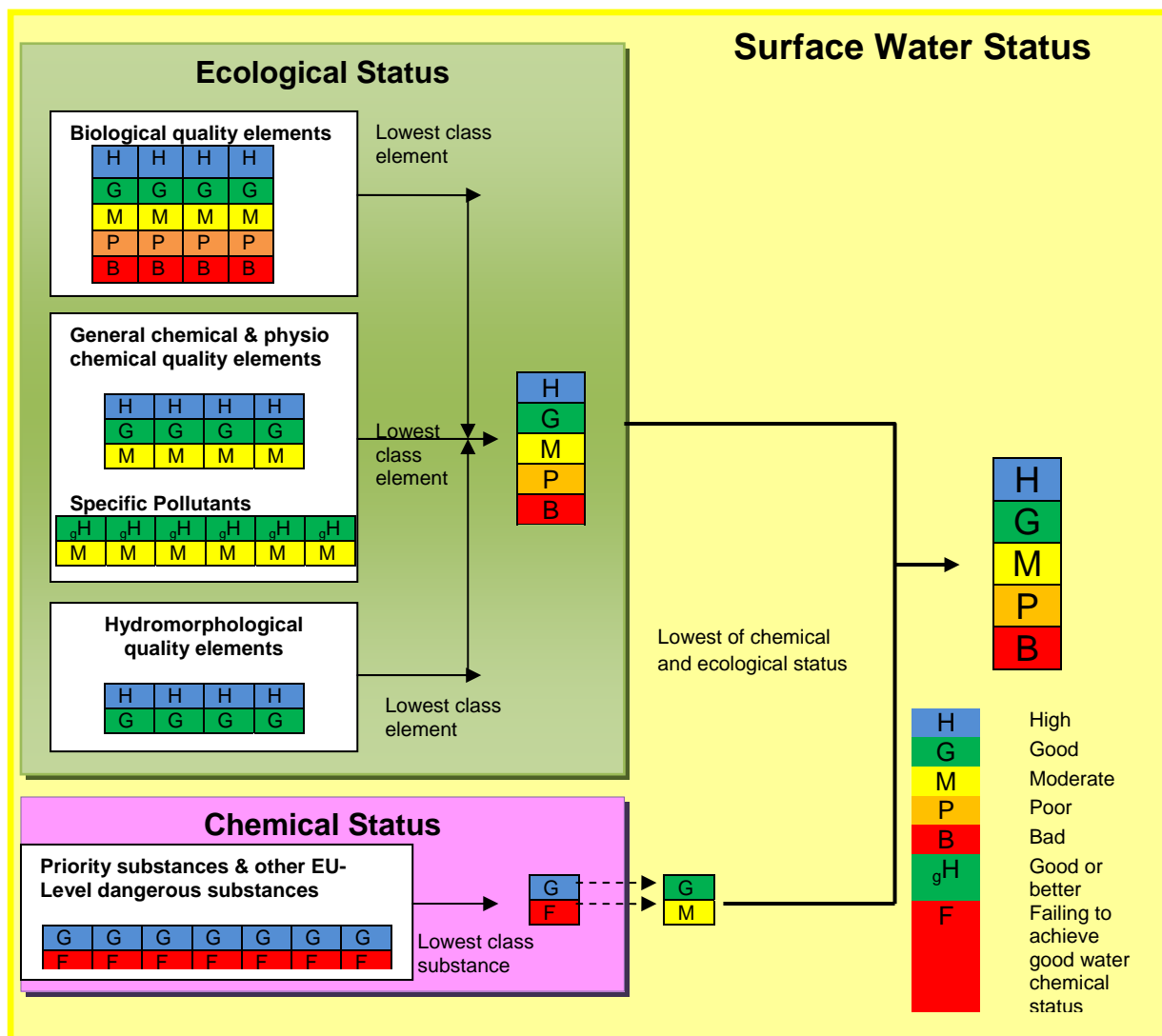


Fig. 8.06: How the different water quality element results are combined to classify ecological status, chemical status and the overall surface water status: Adapted from the 'Recommendations on Surface Water Classifications Schemes for the purposes of the Water Framework Directive' UKTAG 2006.

The ecological status is determined primarily by the lowest class of the biological component. The general and physiochemical element can lower the status to moderate only. If both these elements are classified as high the hydromorphological

element can only lower the overall ecological status to good. Whilst the ecological status has five classes (High, Good, Moderate, Poor and Bad), the chemical status has two (High and Moderate). The lowest status of the two determines the overall surface water status. This is termed the 'one out – all out' principle.

Ecological Status: Classification of Quality Elements

The various elements monitored for ecological classification are listed in table 8.07.

Biological	General/Physiochemical	Hydromorphological
1. Macroinvertebrates	1. Dissolved Oxygen (% Saturated)	1. Quantity & dynamics of water flow
2. Macrophytes	2. Soluble Reactive Phosphorus (SRP)	2. Connection to groundwater
3. Phytobenthos	3. pH	3. River continuity
4. Fish	4. Specific Pollutants (includes ammonia)	4. River depth & width variation
		5. Structure & substrate of the river bed.
		6. Structure of the riparian zone

Table 8.07. Quality elements which are monitored for the ecological status.

Biological Quality Elements

Macro-invertebrates

Different species of macro invertebrates are more sensitive to specific forms of pollution and therefore environmental quality ratios (EQRs) based on biological results may be used to assess water quality. Macro invertebrates are also the dominant prey of both salmonid and some non salmonid fish species. The measure of diversity of a macro invertebrate community can be a more reliable indicator of the pollution pressures within a catchment than relying solely on an assessment of chemical water quality. The impacts of pollution on a macro invertebrate community are longer lasting and can highlight intermittent pollution impacts that may be missed through chemical water quality monitoring.

RIVPACS had been previously used to classify the biological quality of a site in terms of Macroinvertebrates. This has since been updated to meet WFD requirements and is called the **Rivers Invertebrate Classification Tool (RICT)**. RICT utilises the same principle of a biotic scoring system to produce the EQRs on which the classes are based:

$$\text{EQR Taxa} = \frac{\text{BMWP Observed number of Taxa}}{\text{BMWP Predicted number of Taxa (As derived from RICT)}}$$

$$\text{EQR ASPT} = \frac{\text{BMWP Observed ASPT (Average Score Per Taxon)}}{\text{BMWP Predicted ASPT (As derived from RICT)}}$$

Class	ASPT EQR	NTAXA EQR
High	0.97	0.85
Good	0.86	0.71
Moderate	0.75	0.57
Poor	0.63	0.47

Table 8.08. Environmental Quality Ratio classifications for ASPT and NTaxa.

Macrophytes

Macrophytes (aquatic vegetation) have been included in the classification as a measure of the effects of nutrient enrichment. The tool employed is Leafpacs which assesses species composition, diversity and abundance.

Diatoms

Diatom (microscopic organisms) species presence and relative abundance are also indicative of nutrient enrichment in both rivers and lakes. To assess the effect of these on the ecological status the **Diatoms Assessment for Rivers and Lakes Ecological Quality (DARLEQ)** tool has been developed which classifies on levels of nutrient sensitivity and tolerance. The higher the EQR the more sensitive diatom species present. A minimum of three samples over several years is necessary for this classification resulting in few water bodies being classified at present.

Class	Diatoms EQR	Macrophytes EQR
High	0.93	0.8
Good	0.78	0.6
Moderate	0.52	0.4
Poor	0.26	0.2
Bad	0	0

Table 8.09. Environmental Quality Ration Classifications for Diatoms and Macrophytes.

Fish

At present there is no tool available for the classification of fish. It has been determined by expert judgement based on the quantitative electrofishing surveys undertaken by the Loughs' Agency (Foyle and Carlingford Areas) and AFBI (for other rivers in Northern Ireland).

General Chemical and Physiochemical Quality Elements

The general chemical elements required for WFD purposes are Dissolved Oxygen (% saturated), pH, and Soluble Reactive Phosphorus (SRP). Notably BOD is no longer used to classify a water body. It is still being monitored for investigative purposes where DO standards are not being met. In addition to these elements a number of 'specific pollutants' were also to be identified from a WFD list. These are

pollutants which are being discharged in significant quantities. Of particular importance from a fishery aspect is Ammonia. There are 18 other pollutants listed (Full list detailed in NIEA's Rationale for Water Framework Directive Freshwater Classification).

Class	DO (% saturation) (10 – percentile)	pH	SRP (µg/l) (annual mean)	Ammonia (mg/l)
High	80	(5 & 95 percentile) ≥6 to ≤9	20	0.2
Good	75		40	0.3
Moderate	64	4.7 (10 percentile)	150	0.75
Poor	50	4.2 (10 percentile)	500	1.1

Table 8.010. Classification for General Chemical & Physiochemical Quality Elements.

Hydromorphological Elements

Hydromorphological elements have been incorporated into the classification system to assess the impact that morphological alterations (e.g. sediment removal and channelisation) have on the ecological status of a river. The procedure employed to classify these elements is based on the previous NS Share method, **Rapid Assessment Technique (RAT)**. The new method is the **River Hydromorphological Assessment Technique (RHAT)** and has been developed to be fully compliant with the WFD.

Chemical Status: Classification of Quality Elements.

Although chemical elements are already being assessed for the ecological status, the Chemical Status refers solely to those chemicals which have been defined as priority substances which are *'those which present a significant risk to or via the aquatic environment'*. These include Pentachlorophenol, Carbon Tetrachloride, Aldrin, Isodrin and Napthalene. The full list and their Environmental Quality Standards (EQS) are detailed in the framework's 'daughter' Directive 2008/105/EC.

The principal objective of the Water Framework Directive is to achieve good surface water status in all water bodies by 2015. The classification of the water bodies are to be published in the River Basin Management Plans, the first of which was published in Dec 2009.

The directive has separate classification schemes for heavily modified water bodies, and protected areas. Heavily modified water bodies have been classified on their ecological potential, details of which are available on the NIEA website (www.ni-environment.gov.uk/wfd). For protected areas (e.g. River Foyle and its tributaries) maps are to be included in the River Basin Management Plans to indicate whether the objectives, established through legislation to define these areas, have been achieved. Similar classification methods are in use in the Republic of Ireland for WFD monitoring.

The Habitat's Directive (92/43/EEC) indicates that the water quality in these protected areas should achieve targets that are necessary for the designated species. The favourable conditions specific for salmonid rivers have been based on publications from Conserving Natura 2000 Rivers, the European Life Series, Ecology Series; No 7 Ecology of the Atlantic Salmon, *Salmo Salar* L (Table 9.11).

Parameter	Level	Percentile	Reason
BOD (mg/l)	2.5	90	High Status
Ammonia (mg/l)	0.25	90	High Status
Dissolved Oxygen % Saturation	80	10	High Status
Unionised Ammonia (mg/l)	0.025	95	Favourable Conditions Habitat Forming
Suspended Solids (mg/l)			Specific for Atlantic Salmon
Nursery Grounds	10	-	
Migratory Passage	25	-	
Soluble Reactive Phosphorus (mg/l)	Background	-	Specific for Atlantic Salmon

Table 8.011. Favourable condition targets for Atlantic salmon



Figure 8.012. Flattened mayfly nymph from the order *ephemeroptera* high scoring macro invertebrate indicative of good water quality

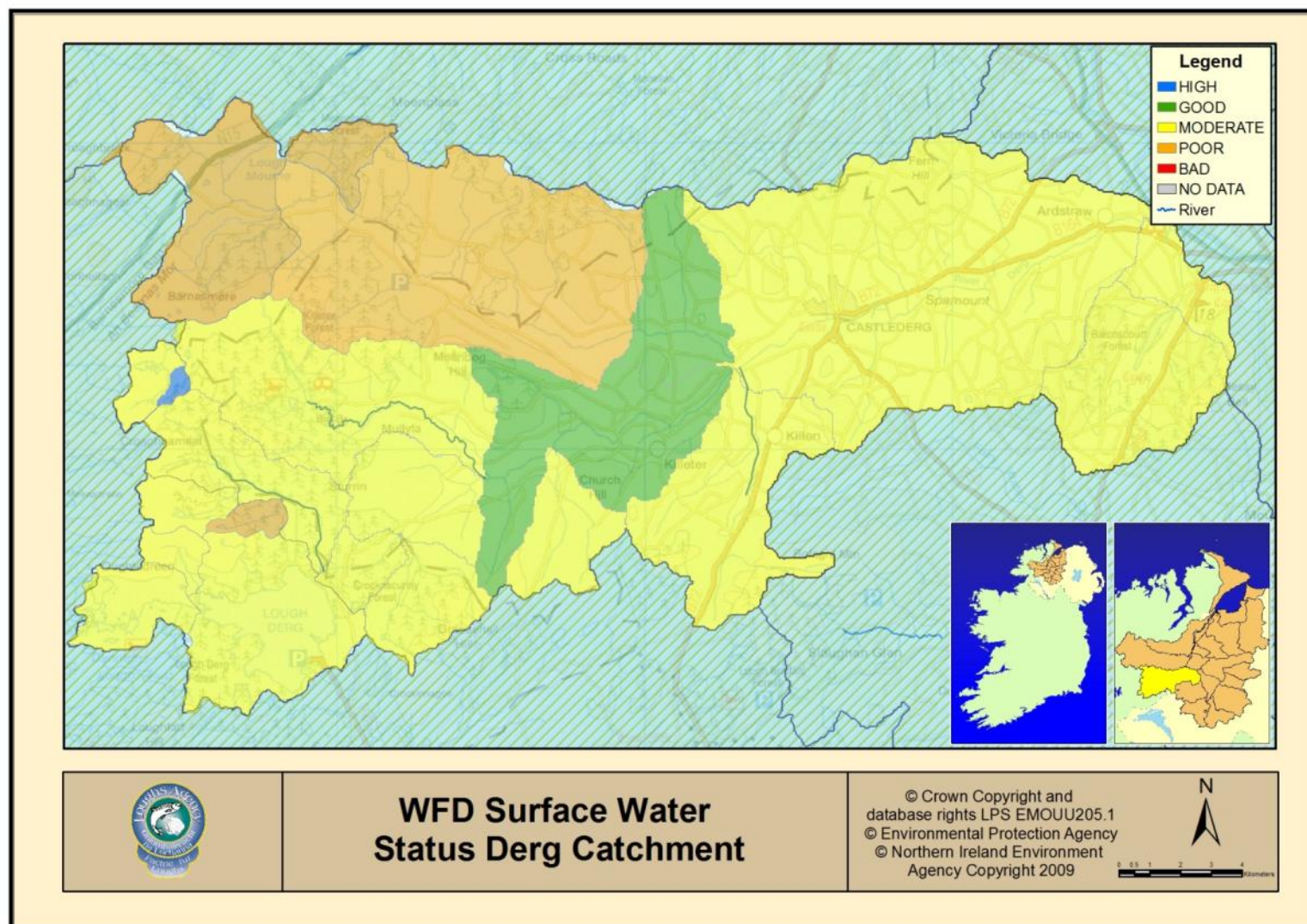


Figure 8.013. Overall WFD surface water status for the Derg catchment 2009

8.1 WFD Fish Classifications 2009

The Loughs Agency is monitoring freshwater fish within the Foyle and Carlingford areas for reporting under the WFD. Working under the direction of the Northern Ireland WFD Fish Group (composed of NIEA, Loughs Agency, AFBI and DCAL personnel) surveillance monitoring stations are surveyed for fish populations once during each WFD reporting cycle.

Seven Water Framework Directive fish surveillance monitoring stations were surveyed within the Loughs Agency jurisdiction in 2009. 0% were classified as high status, 43% classified as good status, 43% as moderate status 14% as poor status and 0% as bad status.

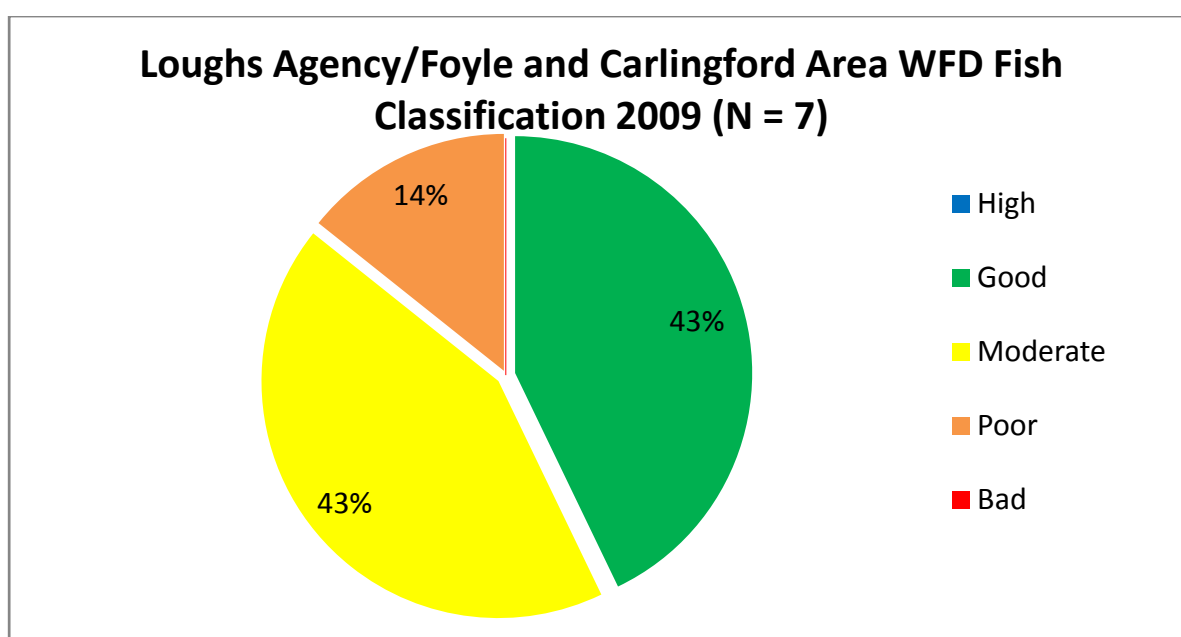


Figure 8.11. LA fish classification 2009 based on seven sites surveyed within the Foyle and Carlingford areas

In the absence of a finalised fish in rivers classification tool (currently under development) professional judgement has been used to classify selected river sites for fish. These have then been incorporated into ecological status classifications and final surface water classifications.

Data collection was conducted in the field during the summer of 2009 and involved the use of a quantitative electrofishing methodology commonly used for wadable rivers. This technique requires the netting off of a small section of river approximately 100m² using stop nets.

Removal sampling is then conducted utilising electrofishing equipment with the numbers, age class and species of each fish being recorded for each pass. After an appropriate depletion has been achieved, which facilitates a density estimation to be made all fish are returned alive to the river.

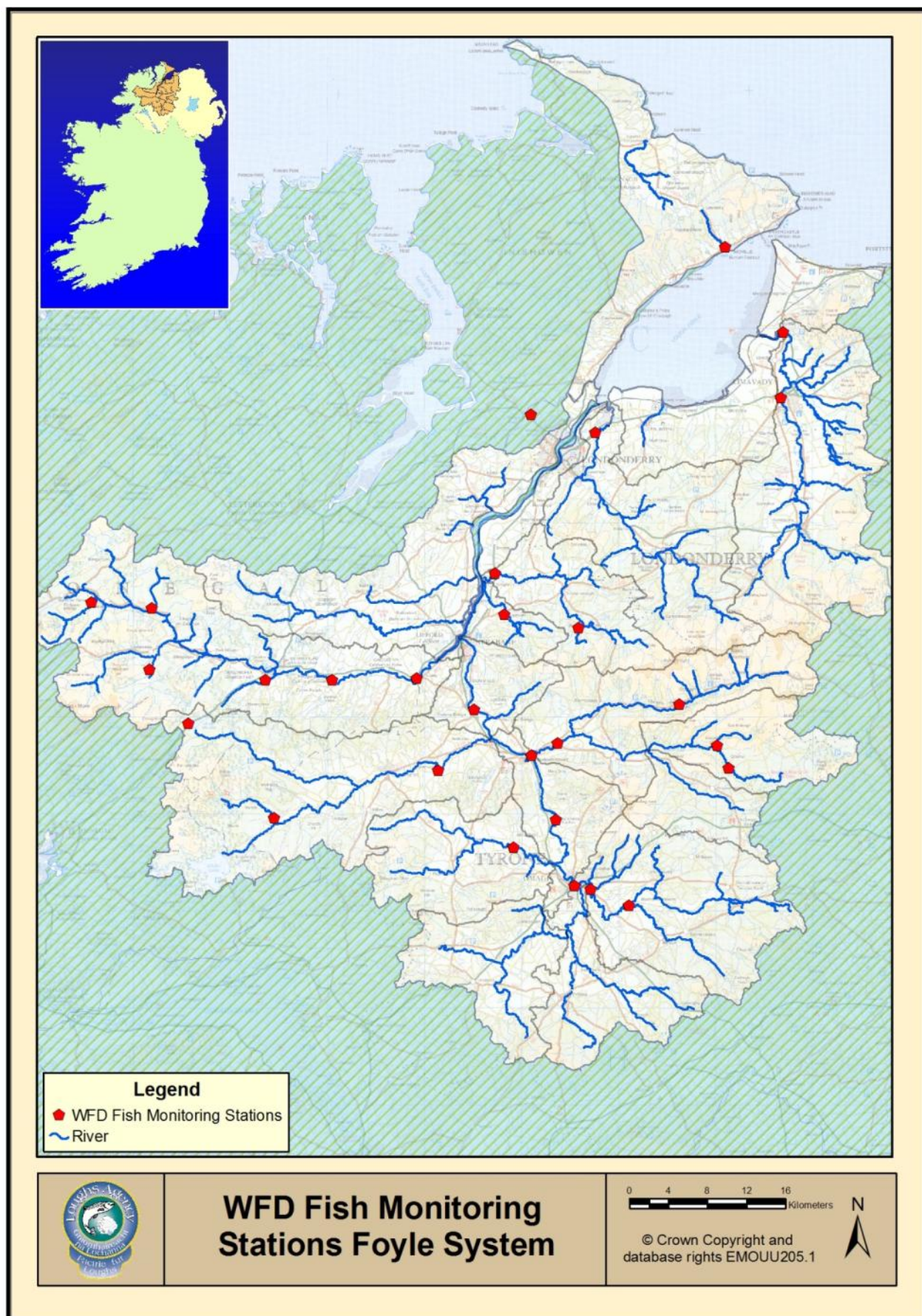


Figure 8.12. WFD fish surveillance monitoring stations in the Foyle system

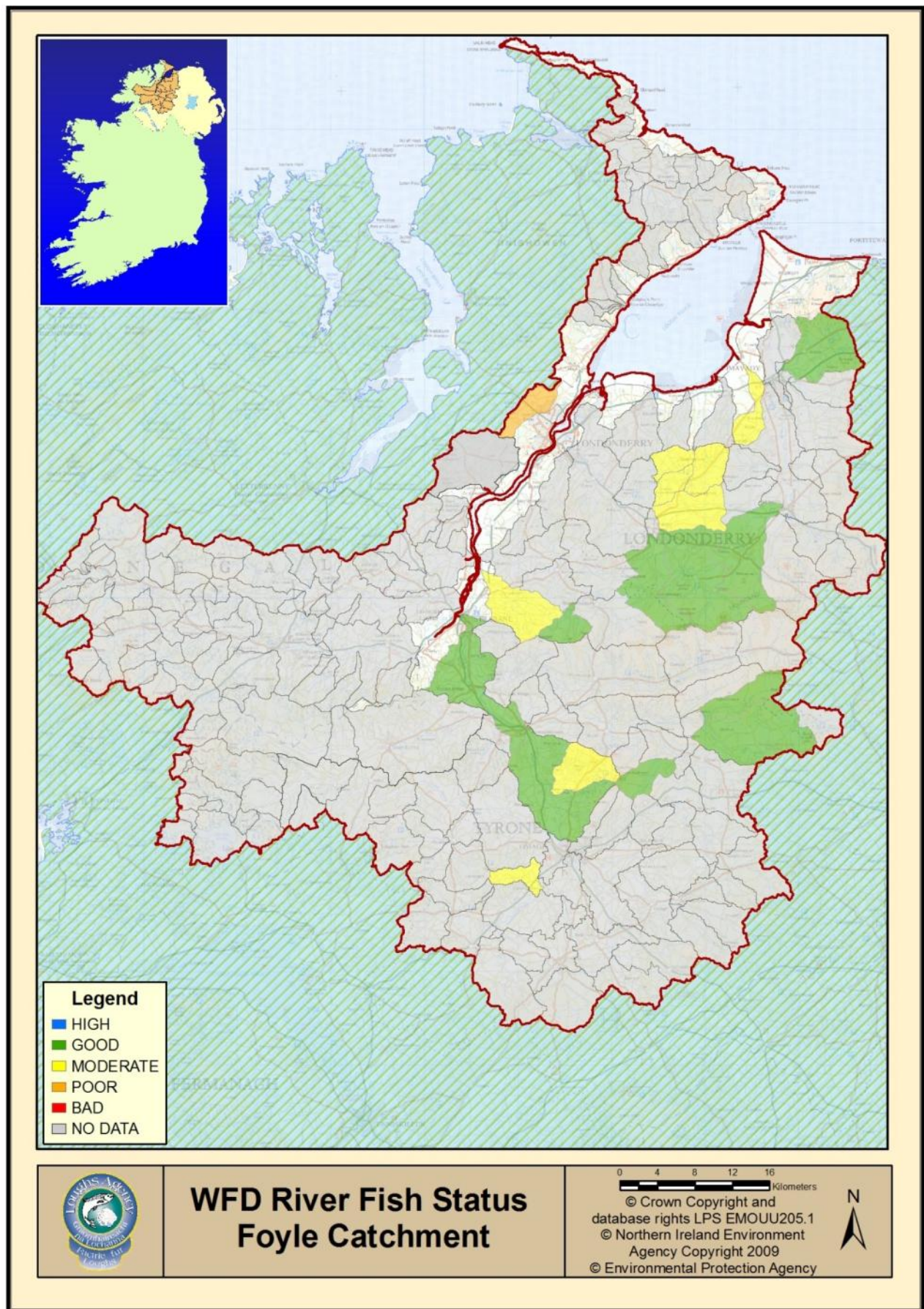


Figure 8.13. WFD fish classifications in the Foyle system

In addition to directed WFD fish surveillance monitoring the Loughs Agency has collated other suitable fishery data collected from 2005-2009 and derived WFD fish classifications from this. An example of this data is outlined below.

Fishing	Trout 0+	Trout 1+	Total
1st	18	0	18
2nd	12	0	12
3rd	1	0	1
Total	31	0	31

Table 8.14 Depletion sampling results from quantitative electrofishing survey Lough Barderg outflow 2005

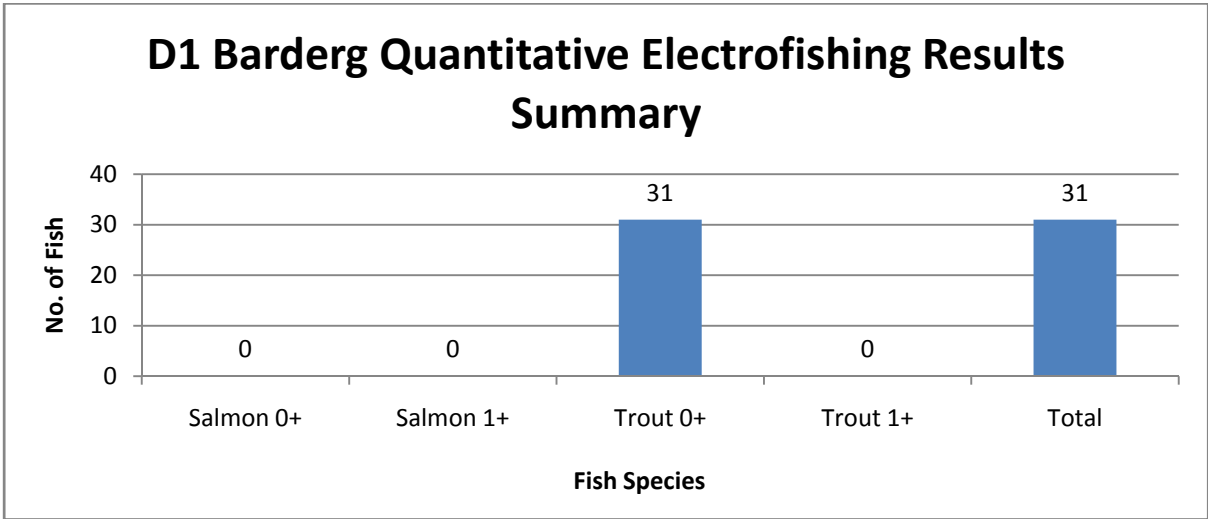


Table 8.15 Species and numbers caught

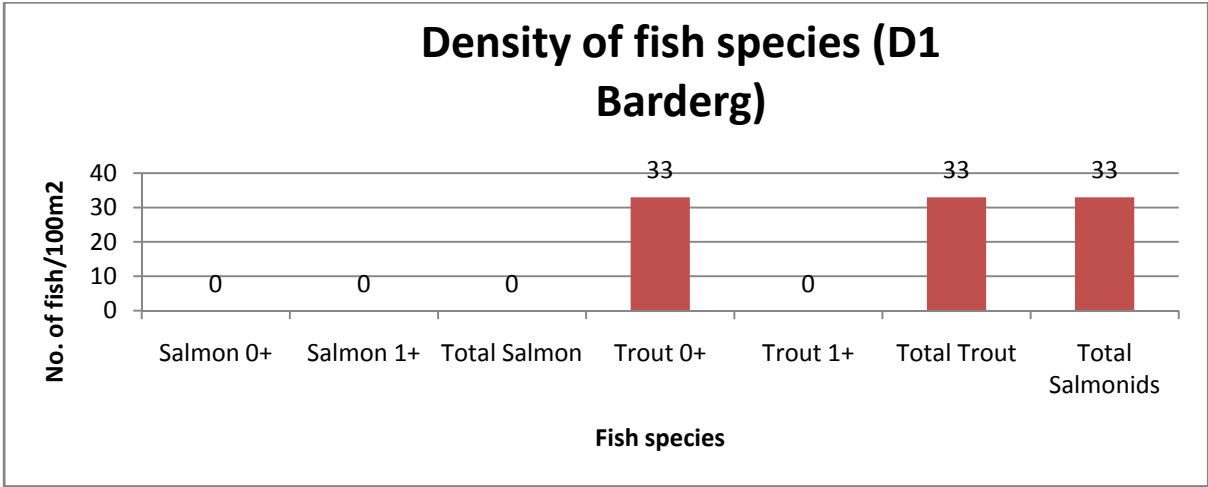


Table 8.16 Density of species by age class per 100m²

9.0 CONSERVATION AND PROTECTION

The Loughs Agency continues to carry out an active fishery protection role throughout the catchments of the Foyle and Carlingford areas including the sea area, River Foyle and on all tributaries. Tables 9.0, 9.01 and 9.02 outline the number of patrols and some duties carried out by the Loughs Agency staff in the Derg catchment and seizures for the Foyle area.

A team of Fishery Officers are responsible for the Derg catchment dividing their time between the Owenkilow catchment, Glenelly catchment, Mourne catchment and the standing waters within the Loughs Agency Central zone. This is in addition to regular fishery protection patrols on the River Foyle.

Year	Patrol Hours	No of Licence Checks	Joint Patrols	On-site Inspections
2006	554	172	0	37
2007	780	214	0	35
2008	842	188	0	64
2009	1202	196	0	85

Table 9.0 Breakdown of conservation and protection duties in the Derg catchment 2006-2009

Year	2009	2008	2007	2006	2005	2004	2003
Nets	128	114	100	97	114	181	198
Salmon	6	92	56	91	118	130	155
Rod & Reel	96	136	85	26	10	16	12
Vehicles	0	1	0	2	1	1	0

Table 9.01 Seized nets, salmon, rod/reels and vehicles in the Foyle system 2002-2009

Year	Nets	Salmon/Trout	Rod/Reel	Vehicles	Boats
2006	1	0	3	0	0
2007	2	0	5	0	0
2008	3	0	8	0	0
2009	1	1	5	0	0

Table 9.02 Seizures in the Derg catchment 2006-2009

9.1 Habitat Improvement Works

In addition to the traditional protection duties carried out by the Loughs Agency staff, conservation and improvement of habitat has been increasing over recent years.

Over time man has imposed significant changes on the natural courses of many rivers and flood plains. The driving forces behind these changes have included amongst others; arterial drainage schemes to provide more suitable land for agricultural purposes, urban sprawl, infrastructure expansion (roads etc.), flood defences, water abstraction and hydro power generation. All have had a significant impact on the natural meanderings and discharges of rivers and tributaries resulting in faster runoff of floodwaters ultimately leading to a change in the morphology and flow regime of rivers and resultant impacts on fisheries.

While all these processes have had some impact within the Foyle system, it is still considered to be a relatively natural system with natural river structure present in the catchments headwaters. In areas that have been altered methods for reinstating lost habitat are investigated and where appropriate action taken.

In 2009 a number of habitat improvement schemes were implemented within the Derg catchment. The number of Salmon spawning in the Mournebeg River has been depressed for a number of years, it was felt that a contributing factor to this decline was the loss of spawning gravels from the areas that fish would traditionally spawn. Currently gravel is in short supply within the river, this leads to several fish utilising the same patches of gravel with the associated loss of production. It was agreed that the introduction of spawning gravel would allow fish to spread out, prevent overcutting of existing redds and reduce competition for the limiting factor.

In response to this the crew devised a plan that would involve the reintroduction of spawning gravel to a number of locations throughout the mid/upper reaches of the river. The overall thinking behind this strategy was to install large sacrificial fords of gravel upstream of those areas that fish traditionally spawn and let the natural movement of the river redistribute those gravels, this has the advantage of allowing the gravel to be placed in easily accessible parts of the river thus reducing the associated costs. As this was a pilot scheme it was decided to start with a relatively small amount of clean graded gravels (200 tonnes) and monitor the situation with a view to repeating the process at a future date if successful. It is worthy of recording that even though the gravel fords were installed with a view to natural redistribution several fish made use of the deposits and cut redds in the newly laid gravels, it is intended to assess the success of these redds in the following electrofishing season.

It had been noted that the biotic scores within the Leaghany river appear to be suppressed and routine monitoring would suggest that a contributing factor to this situation was acid pulses within the river system possibly as a result of the afforestation of a significant portion of the catchment, this suppression in turn has a

knock on effect on the food level available and thus directly on the carrying capacity of the river. In an attempt to address this problem the crew devised a strategy of installing a series of soft calcareous limestone rubble mats into the worst affected tributaries, in an attempt to buffer this effect. Costs for the provision of such rock and the subsequent placement of same were obtained and the most cost effective chosen.

In total 125 tonnes of limestone were placed in a series of rubble mats throughout the catchment and a monitoring regime put in place to ascertain the effectiveness of the scheme with a view to repeating the project if a significantly positive effect is shown.



In 2003 the Loughs Agency became aware of a problem at the outflow of Lough Derg. The outflow had been impounded to maintain water levels within the Lough, Figure 9.1 and 9.11.

Any activities with the potential to cause an impact on the fishery resources of the Foyle and Carlingford area need to be officially sanctioned by the Loughs Agency and other relevant statutory bodies in Northern Ireland or the Republic of Ireland.

In this instance the Loughs Agency had not been consulted and the source of the River Derg had been artificially blocked. The impoundment prevented upstream and downstream migrating fish from accessing the river and lough as well as dewatering a considerable section of the river, significantly impacting upon the salmonid nursery habitat and associated aquatic and riparian flora and fauna immediately downstream of the lough outflow, figures 9.12 and 9.13.



Figure 9.1 Artificial impoundment at the outflow of Lough Derg into the River Derg. Photograph taken looking downstream



Figure 9.11 Secondary impoundment on the River Derg looking upstream towards first impoundment



Figure 9.12 Dewatered stretch of River Derg below impoundments



Figure 9.13 Good quality salmonid nursery habitat downstream of impoundments highlighting dewatering

The severe dewatering of the River Derg in 2003 was due to conflicting stakeholder objectives. From a fishery perspective river water flow needs to be maintained to facilitate the passage of upstream and downstream migratory fish species of various life history stages in order to provide access to and from Lough Derg.

The Loughs Agency endeavoured to apply a solution that would be acceptable to all stakeholders. This involved removing any barriers to fish migration and guaranteed river flow in the upper section of the River Derg. An offset boulder weir was also constructed, figure 9.14, which acted as an impoundment yet allowed water and migrating fish over in all flow conditions.

The river directly downstream of the location of the second impoundment was narrowed to facilitate migratory fish passage in all flow conditions. This was achieved

by constructing a deflector groyne on the left hand bank increasing flow and water depth, figure 9.15.



Figure 9.14 Solution, offset boulder weir, location of secondary impoundment opened for fish access and deflector location.

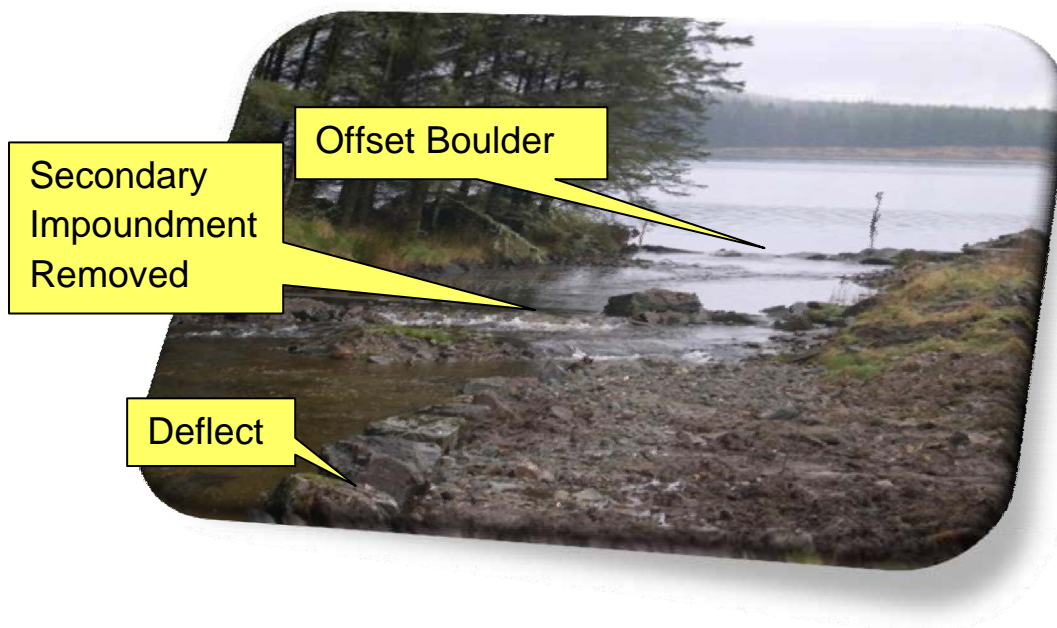


Figure 9.15 Offset boulder weir, location of secondary impoundment opened for fish access and deflector groyne location. Picture taken in 2005 immediately after works were completed.

In-channel works were completed in 2005 after a number of temporary measures had been used to accommodate fish passage. Figures 9.16-9.18 show the site one year after the works were completed. The river substrate has stabilised providing suitable nursery habitat and possibly some spawning habitat. Water levels of the lough were maintained and access for upstream and downstream migrating fish was possible in all flow conditions.



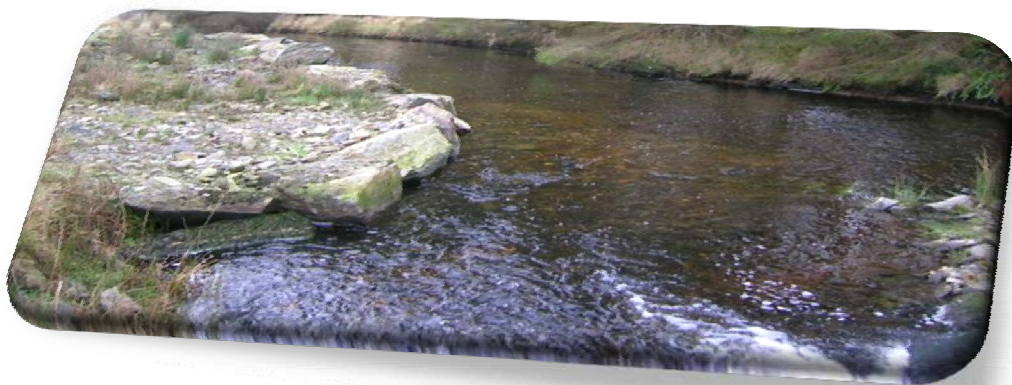


Figure 9.16 Offset boulder weir. Figure 9.17 Location of secondary impoundment. Figure 9.18 Deflector groyne. 2006

In late 2006 early 2007 the Loughs Agency were dismayed to discover that the in-channel improvement works, constructed at significant expense in 2005 had been removed without permission or consultation and the passage of migratory fish impeded once again. The Loughs Agency has investigated this incident and has implemented measures to facilitate fish passage.

In 2006 a number of in-channel habitat improvement schemes were completed on feeder tributaries of Lough Derg. The schemes were designed to improve juvenile salmonid production and included the installation of habitat units, bankside protection and fencing.

It is anticipated that further works will be conducted within the Derg catchment including developing native riparian buffer strips adjacent to watercourses and gravel loosening in areas where spawning gravels have been compacted. Working partnerships are being developed with the relevant forestry bodies to ensure best practice is implemented with reference to coniferous forestry plantations and their management in relation to aquatic resources.

Ongoing water resource issues continue to impact the upper Derg catchment, it is hoped that increased regulatory function under the Water Framework Directive will provide an appropriate mechanism for the licensing of abstractions and impoundments in an ecologically sensitive manner as of 2009 these functions have not been created.

In 2009 the Loughs Agency working in close partnership with Pettigo and District Angling Association began to discuss methods for improving the declining wild brown trout stocks of Lough Derg. Previous research utilising Genetic Stock Identification methods had demonstrated that greater than 80% of Lough Derg trout were downstream spawners, spawning primarily in the River Derg. Figure 9.17 highlights

the significant inflowing tributaries which under normal circumstances should be providing significant spawning and nursery opportunities for Lough Derg trout.

It has been proposed to develop a wild fisheries conservation project incorporating brown trout aimed at collating available baseline data, developing working partnerships with significant stakeholders, additional survey data collection and a proposed programme of in-channel and riparian habitat improvements.

A significant proportion of the Lough Derg catchment is currently covered by coniferous forestry plantations in some circumstances up to and overhanging the feeder tributaries to Lough Derg. A combination of impassable forestry road culverts, tunnelling by the tree canopy leading to impacts on productivity and associated impacts on the hydrological regime of the former bogland surrounding the lough have potentially had significant impacts on the carrying capacity of these tributaries for native fish species. Fishery monitoring of forested tributaries and non forested tribs is proposed for 2010. This data will then be used for comparison purposes if significant land use change can be agreed with the land owners. It is proposed that monitoring would be conducted at both control and experimental stretches.

It is recommended by the Loughs Agency that best practice with reference to native riparian woodland planting and management is implemented throughout the Lough Derg catchment.

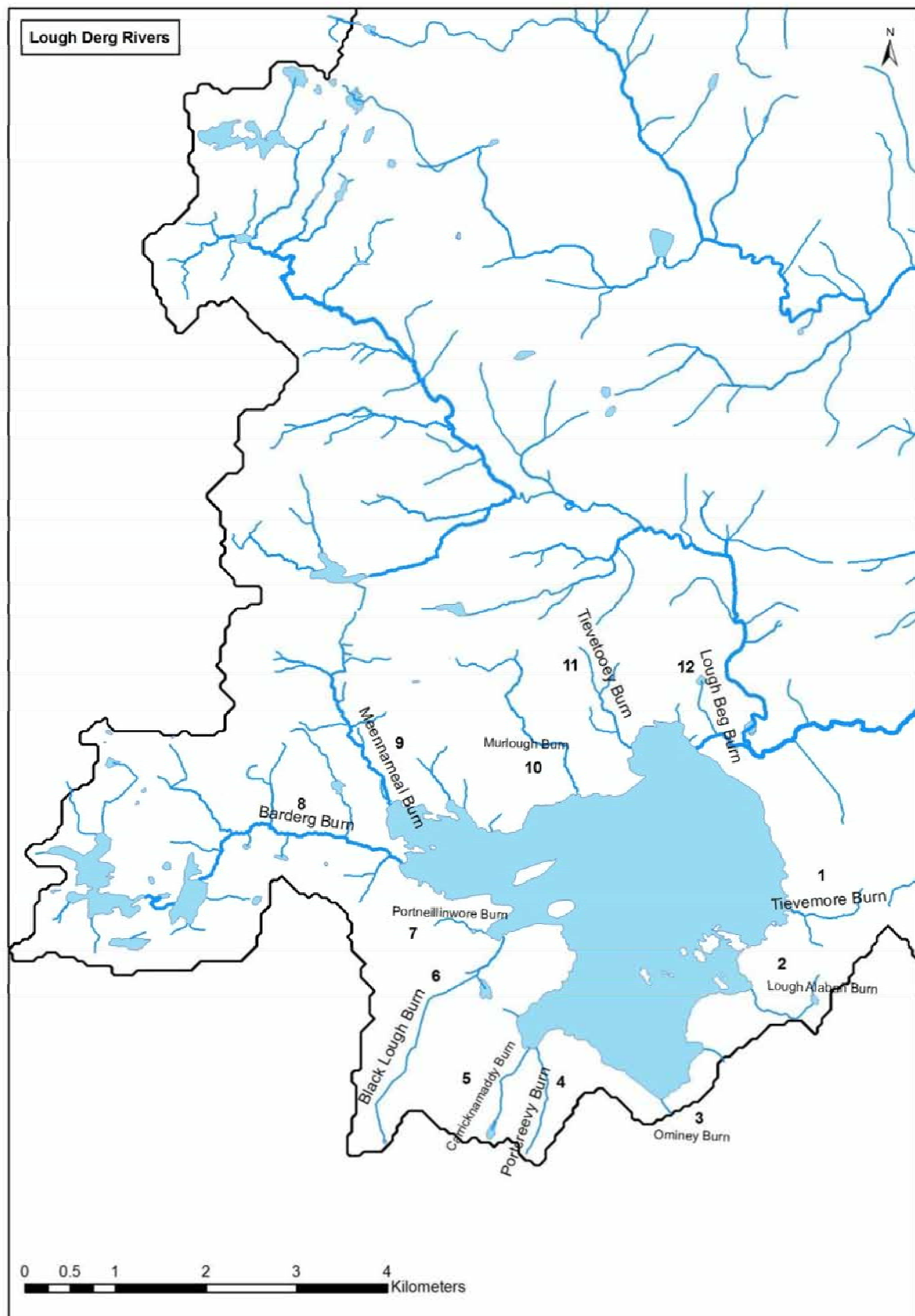


Figure 9.17 Lough Derg and Tributaries

10.0 ENVIRONMENTAL ISSUES

Some environmental issues affecting water quality have already been outlined previously. The following list presents some of the main habitat pressures to salmonids within the Foyle system:

- Agricultural activities – enrichment from natural and artificial fertilisers often make their way into watercourses, enhancing problems with eutrophication.
- Forestry activities – planting and felling operations can lead to increased loading of suspended solids in watercourses. Established forestry as a major upland land use has been attributed to increased acidification.
- Barriers to migration – a range of natural and anthropogenic features on rivers can lead to barriers for migrating salmonids and other fish species. These can include weirs and hydro-electric schemes.
- Gravel removal – gravel is extremely important for the creation of redds for spawning fish. Removal of gravel from the river bed in sensitive areas can destroy potential spawning and nursery habitat.
- Quarrying activities – the extraction of aggregates such as rock, sand and gravel has the potential to cause increased levels of suspended solids in nearby watercourses. Sufficient mitigation measures should be in place at such sites to trap increased sediment loads entering rivers and streams.
- Abstraction – water abstraction from watercourses for a range of uses is increasing throughout the Foyle and Carlingford catchments. Unless appropriately assessed and licenced, these activities have the potential to reduce residual flow levels and alter the ecological status of our rivers. This is even more concerning in the light of climate change.
- Peat harvesting – Peat harvesting still occurs in small upland pockets throughout the Foyle system. It has the potential to increase sediment loading in receiving waters.
- Sewage treatment – sewage and waste water treatment works are under considerable pressure with the increase in urban development in our towns and villages. Several inadequate systems throughout the Foyle system continue to pollute rivers.
- Hydropower – small-scale hydropower schemes are beginning to appear on rivers throughout the Foyle and Carlingford catchments. Baseline fishery data must be provided to allow for sufficient assessment of any proposed scheme, unless located above an impassable fish barrier.
- Urban development – the expansion of large-scale housing developments and the associated pressures on waste water and sewage treatment works are a potential source of water pollution in the event of overflows

- Drainage and canalisation – these have direct impacts on the quality of available fishery habitat within the catchments. Canalisation in particular can lead to the removal of important spawning, nursery or holding areas of rivers.
- Industrial discharges – larger urban areas with industrial discharges have the potential to cause pollution through toxic discharges and can alter the temperature of the watercourse.
- Septic tanks – a proliferation of single dwellings and their septic tanks is an ongoing area of concern. Initial research from parts of the Foyle system indicate that this is major contributor to decreased water quality and local increases in suspended solids.

11.0 DESIGNATED AREAS

The European Commission Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (EU Habitats Directive 92/43/EEC) requires that all member states designate Special Areas of Conservation (SACs) in order to protect threatened habitats and species. The European Commission Directive on the Conservation of Wild Birds (Birds Directive 79/409/EEC) also requires the designation of Special Protected Areas (SPA's). Together the designated SAC's and SPA's create the NATURA 2000 network of protected sites. A number of rivers have been designated as SAC's both in Northern Ireland and in the Republic of Ireland.

One of most recent additions to the list of SACs is the River Foyle and Tributaries SAC which includes the River Derg, Mournebeg River and Glendorgan River.

Atlantic salmon is listed as an Annex II and Annex V species within the directive meaning that they are of community interest requiring the designation of an SAC (only in fresh water).

“The River Foyle and its tributaries have the largest population of Atlantic salmon in Northern Ireland. The majority of the salmon returning are grilse (single wintering salmon), with a smaller but important number of spring salmon (multi-wintering salmon) also occurring. Research has indicated that individual sub-catchments within the system support genetically distinct salmon populations” (Environment and Heritage Service).

Within the Derg catchment there is a diverse range of landscapes, habitats and species. National and as mentioned above European Legislation requires that important and threatened landscapes, species and habitats are protected by various designations.

At the national level the primary designations within the Derg catchment include the designation of Areas of Special Scientific Interest (ASSI) including Moneygal Bog which is one of the finest raised bog pool systems in Northern Ireland with associated species of importance and Moneygal Bog Part II an area of cutover lowland raised bog important for its vegetative ecology providing habitat for a diverse range of birds including Snipe, Woodcock and Meadow Pipit. Essan Burn and Mullyfamore, a large area of blanket bog with intact hydrology and vegetation including the carnivorous plant Sundew, is also an ASSI. Killeter Nature Reserve part of the National Nature Reserve network (NNR) and has been designated to protect its blanket bog and associated species.

At the European level Special Areas of Conservation (SAC's) have been designated to protect landscapes, species and habitats of international importance. Within the Derg catchment these include, Moneygal Bog as above, the River Foyle and its tributaries incorporating the River Derg, the Mourne Beg River and the Glendergan River designated for important Atlantic Salmon populations and river habitat which is viewed as being fast flowing spate rivers characterised by sequences of rapid, riffle and run. The channels are natural and composed of large cobble substrate with scattered boulders and sandy deposits. At the top end of the River Derg there is good representative riparian and in-stream vegetation including Water Crowfoot (*Ranunculus* species). Otters are also present within the catchment.

Dunragh Lough/Pettigo Plateau has also been designated as an SAC. The area includes part of the Derg catchment on the western shore of Lough Derg. It comprises an extensive complex of blanket bog, wet heath, lakes and pools and associated flora and fauna covering an area of low hills and broad basins.

Lough Derg has been designated a Special Protected Area (SPA). The Lough Derg SPA was designated for its populations of Lesser Black-backed Gull (the largest colony in the Republic of Ireland), Herring Gull and Greenland White-fronted Geese (current status unknown). Populations of Common Gull, Tufted Duck, Mallard, Goldeneye and Greylag Geese can also be seen on Lough Derg.

From a fisheries perspective it is not only important to conserve and protect the natural fisheries biodiversity but as part of an ecosystem management approach it is essential to be aware of the wider interconnections between different species and their habitats.

12.0 GENETIC STUDY

A baseline genetic survey was carried out in the Foyle system in 2003 and a resurvey conducted between 2006 and 2008 to analyse the populations of Atlantic salmon present within the Foyle catchment. Results confirmed the existence of genetically distinct populations between and within the rivers and tributaries of the

Foyle area. An understanding of these genetically differentiated populations is required to facilitate appropriate management of conservation measures and the commercial/recreational fisheries.

The report concluded that genetic diversity is high between and within the various salmon populations present in the Foyle system. Each population has evolved over time creating distinct populations (with some gene flow from straying fish) that are best suited to the conditions present in a particular river or tributary. The non-uniform nature of the populations adds to the diversity of life history strategies exercised by Foyle salmon. Distinct differences such as run-timing and age at smolting can act as nature's insurance policy to any catastrophic events which would threaten a homogenous population.

The report stated that the current genetic structure and diversity of Foyle salmon is representative of what might be regarded as the native structure of wild salmon populations. The maintenance of genetic diversity is a core requirement for the long-term sustainability of wild populations, preserving the biodiversity of the wild salmonids of the Foyle system is therefore a primary objective of the Loughs Agency.

13.0 POLLUTION MONITORING

The Loughs Agency has a statutory obligation to monitor the pollution of watercourses. In conjunction with the Northern Ireland Environment Agency all reported pollution incidents are investigated.

14.0 FISHERIES OFFICERS DERG AREA REPORT 2008

In 2008 Fishery Officers continued their work within the Derg catchment. No report was submitted for 2009

15.0 ACTIONS FOR 2009

In order to fully utilise the extensive data resources collected and held by the Loughs Agency on the fish populations and habitats of the Derg catchment it is necessary to focus attention on specific management objectives.

The Loughs Agency has stated in its corporate plan 2008-2010 that it will conserve, protect, manage and improve the fisheries of the Foyle and Carlingford areas. By way of fulfilling these objectives a targeted series of actions utilising data collected

over recent years will be implemented. Fishery owners and local angling clubs will continue to be consulted regarding any proposed works and stakeholder input sought.

15.1 Foyle and Carlingford Areas Ongoing Actions for 2009

Good water quality is essential for the conservation of productive aquatic ecosystems. Fish populations rely on unpolluted water for survival and feeding. The Loughs Agency is committed to ensuring deleterious matter does not enter any watercourse. Routine monitoring is conducted throughout the Foyle and Carlingford areas. Proactive pollution visits and water quality monitoring will continue in 2009.

Water quantity is becoming an increasingly important issue from a fisheries management perspective with continuing demand from a variety of sources including industry, hydro power generation and abstraction for meeting the ever growing needs of industry and the wider population. The Loughs Agency are aware of the conflicting needs of aquatic environments and water resource users and comment on development issues which may have an impact on the important aquatic resources of the Foyle and Carlingford areas with reference to national and international obligations.

In-channel and riparian habitat improvement projects provide an important mechanism by which to improve and protect valuable fishery resources. Over recent years the Loughs Agency has developed a number of projects designed to improve the survival and production of robust populations of juvenile salmonid and other native fish species. These programmes will continue where funding is available, The Loughs Agency also encourages local stakeholder groups to source appropriate funding to develop collaborative habitat improvement projects. The Loughs Agency can provide advice and recommendations for in-channel and riparian improvements and are eager to facilitate the development of such programmes.

Work is continuing to assess and record all **Barriers to Migration** within the catchments of the Foyle and Carlingford areas and these will be incorporated into the Loughs Agency Geographical Information System (GIS). Where finances are available the removal of artificial barriers will be investigated.

Predation by cormorants and seals of economically important fish species continues to be a contentious issue. The Loughs Agency will continue to promote the development of a management strategy incorporating economic, social and environmental factors.

The Loughs Agency will continue to monitor the salmon and inland fishery resources of the Foyle and Carlingford areas, utilising best practice methods including fish counters, juvenile population surveys and catch returns. The importance of the Atlantic salmon resource has been further highlighted by recent genetic studies which have identified the presence of genetically distinct populations

of salmon between and within main river catchments. This information will be utilised when developing habitat improvement programmes to ensure the presence of a diverse resource capable of withstanding change.

Invasive species in both aquatic and riparian habitats have become an important issue in fisheries management and in wider environmental management. Invasive species have the potential to significantly alter ecosystems and their function. The Loughs Agency is contributing towards the development and implementation of invasive species codes of practice.

15.2 Derg Catchment Potential Habitat Improvement Schemes for 2009

- Develop schemes within the inflowing tributaries to Lough Derg in partnership with Pettigo and District Angling Association

15.3 Derg Catchment Specific Actions for 2009

- Implement habitat improvement schemes as dictated by business plan/corporate plan
- Conduct annual fish population surveys and spawning surveys
- Conduct ongoing water quality monitoring and investigate areas highlighted as being of concern
- Develop potential habitat improvement projects including riparian buffer zone creation, fencing, native species planting and in-channel habitat improvements including spawning bed and nursery habitat improvement
- Monitor forestry operations adjacent to watercourses or areas likely to impact on watercourses
- Assist with Water Framework Directive fish monitoring programme
- Monitor all sand and gravel extraction sites and onsite water management practices
- Ensure all fish passes, dams and mill races meet required standards